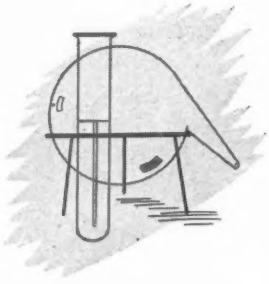
PVP

NEWPORT *Refined* TALL OILS

ACOSIX 700 and ACOLIN



These Tall Oils, uniform in composition, have a very pale color and good, mild odor with a wide range of usefulness, as well as a wider ratio of rosin acids to fatty acids. They have exceptionally low unsaponifiable content.

ACOLIN is a specially-treated refined tall oil.

If you are using a combination of rosin and fatty acids, you can bring your costs way down with these outstanding Tall Oils.

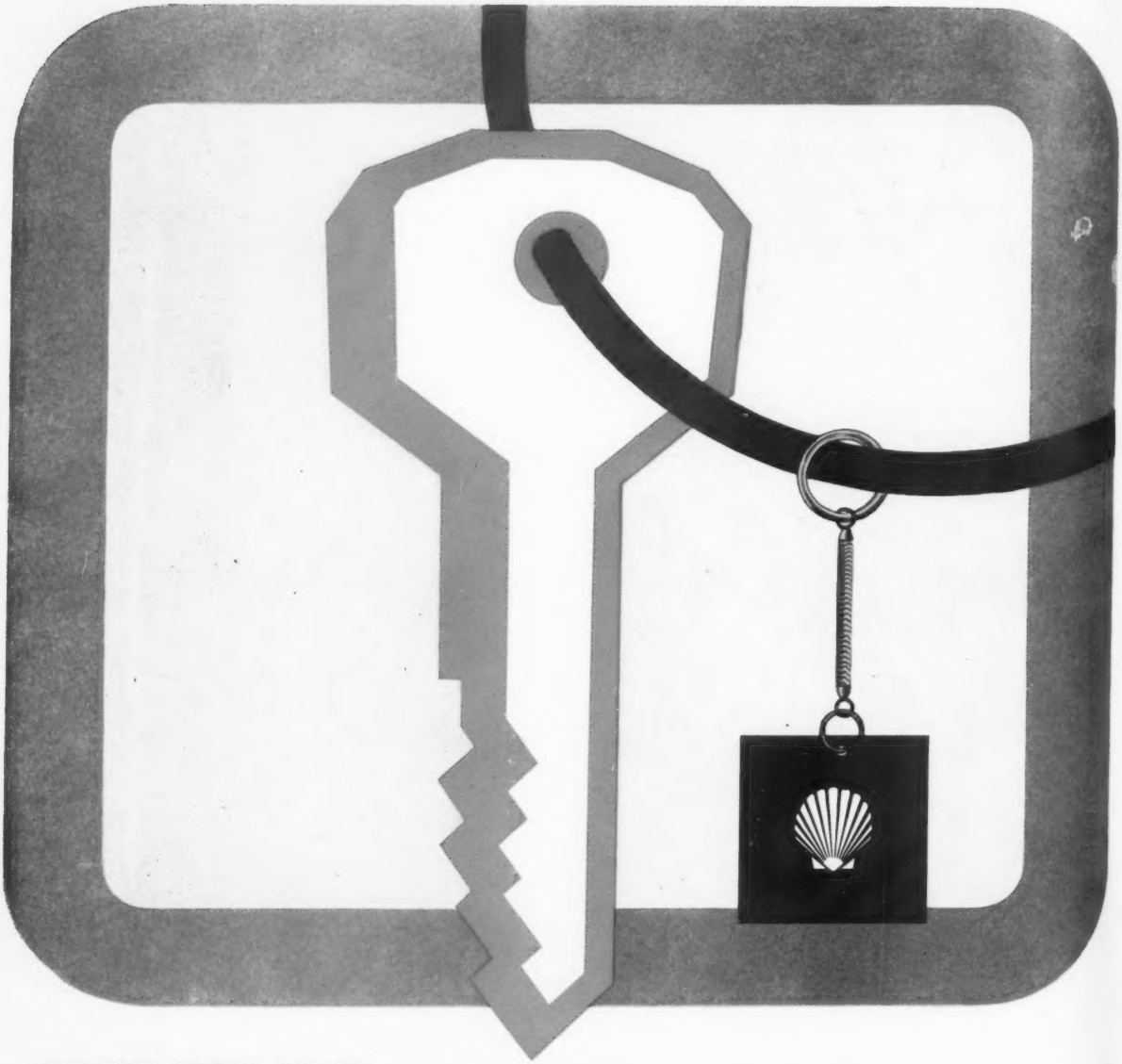
Write for samples and prices

NEWPORT INDUSTRIES Co.

A Division of Heyden Newport Chemical Corporation

342 Madison Avenue New York 17, New York

PVP



MEK solvent power...

... key to economical, high-performance solvent systems

High-purity methyl ethyl ketone is among the most versatile low-boiling solvents available to the surface coating industry. Its strong solvency for lacquer resins has made it a favorite with formulators.

Because its stronger solvent power gives solutions of lower viscosity, higher solids, and greater diluent tolerance—MEK is a preferred replacement for many other low-boiling solvents. The high diluent tolerance of MEK makes possible lowest cost formulations because the proportions of aromatic and aliphatic solvents may be increased.

Technical assistance, backed by years of experience, is available from Shell to assist you with surface coating problems. For more information, write or phone your nearest Shell Chemical office.

SHELL CHEMICAL COMPANY

INDUSTRIAL CHEMICALS DIVISION

Atlanta • Chicago • Cleveland • Detroit • Houston • Los Angeles • Newark • New York • San Francisco
IN CANADA: Chemical Division, Shell Oil Company of Canada, Limited, Montreal • Toronto • Vancouver

SHELL

for rapid, finer grinding of pigments

... in INDUSTRIAL FINISHES
• TRADE SALES
• LACQUERS
• COATINGS
• PRINTING INKS

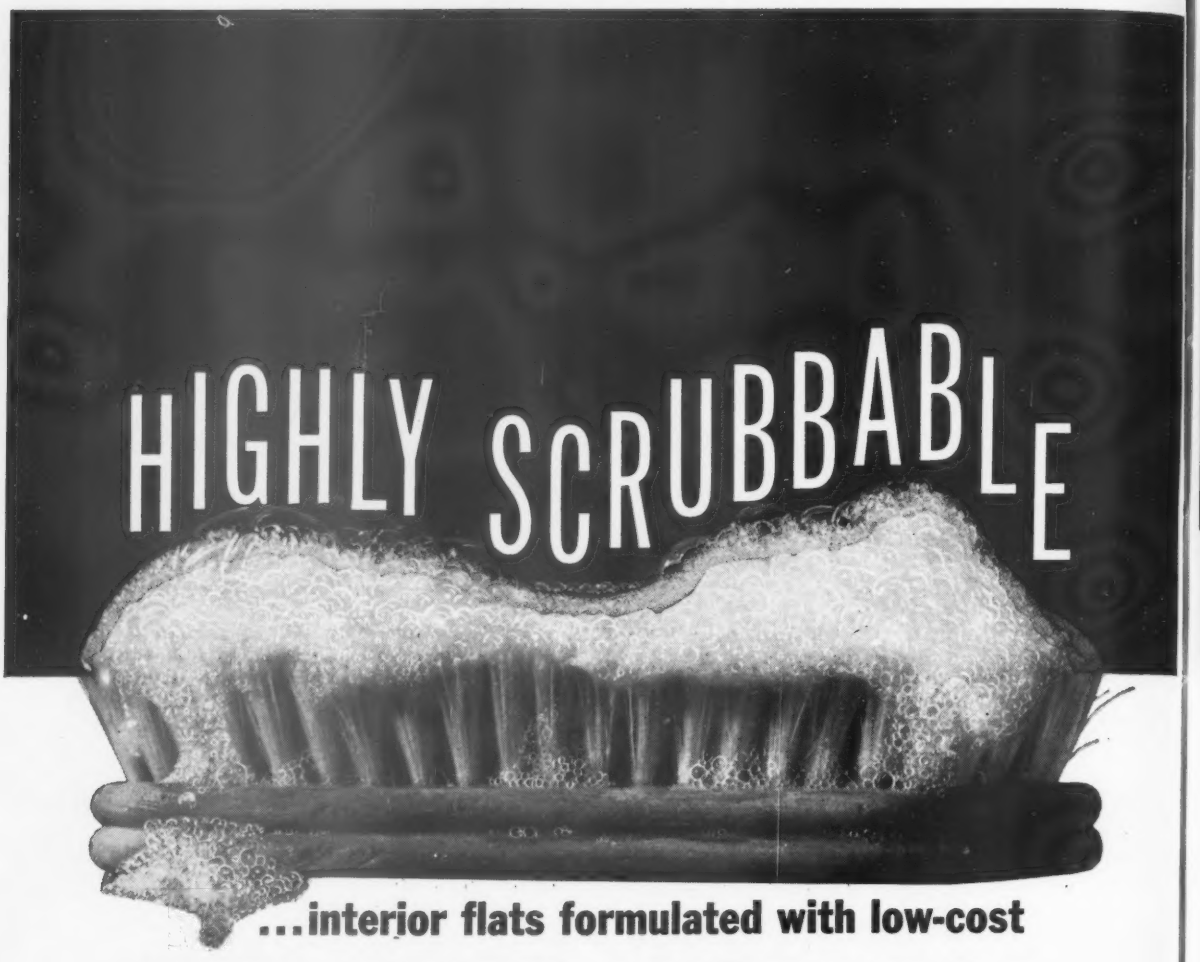
Ceramiface Door and Frame eliminates iron contamination of product due to grinding action on metal door and frame.

Tongue and groove construction—an exclusive feature with Patterson ceramic blocks—insures a tightly keyed lining with thinnest possible cement joints.

Consistently higher product quality, significantly lower operating costs, longer service life—count on these with Patterson Mills equipped with Arlcite Linings and Grinding Media.

Patterson's broad experience in grinding techniques is available to hep you analyze the best combination of operating factors for optimum mill performance—correct mill speed, ball charge and size, material consistency and charge. *Let a Patterson engineer work with you in studying the economics of your grinding application.*

THE *Patterson* FOUNDRY AND MACHINE COMPANY
East Liverpool, Ohio



...interior flats formulated with low-cost

RCI 9307 WALLPOL

Excellent scrub resistance is just one of the properties you can achieve with low-cost RCI 9307 WALLPOL vinyl acetate homopolymer emulsion. High pigment loading and good brushability are others.

In fact, *interior* flats compounded with 9307 WALLPOL are comparable in every respect to those employing copolymer emulsions – with the advantage of a savings in raw material cost of approximately 5¢ per gallon!

Doesn't it make good sense to take advantage of the savings possible using RCI 9307 WALLPOL in your indoor flat paints? You can save too, on combined orders of RCI resins, chemicals and colors to earn applicable quantity prices. Write to Reichhold for full details about 9307 WALLPOL's place in *your* paint production.

FOR EXTERIOR FINISHES,

where maximum color retention and durability are required, RCI 9120 WALLPOL vinyl acetate *copolymer* emulsion is recommended.

Creative Chemistry
...Your Partner in Progress

REICHHOLD

REICHHOLD CHEMICALS, INC., RCI BUILDING, WHITE PLAINS, N.Y.

Synthetic Resins • Chemical Colors • Industrial Adhesives • Phenol • Hydrochloric Acid • Formaldehyde • Glycerine • Phthalic Anhydride • Maleic Anhydride
Sebacic Acid • Ortho-Phenylphenol • Sodium Sulfite • Pentaerythritol • Pentachlorophenol • Sodium Pentachlorophenate • Sulfuric Acid • Methanol

PVP
PAINT and VARNISH PRODUCTION

(REG. U.S. PATENT OFFICE)

MARCH 1960

Formerly PAINT and VARNISH PRODUCTION MANAGER
(Established in 1910 as The Paint and Varnish Record)

VOLUME 50
NO. 3

COPYRIGHT © 1960 PUBLISHED BY POWELL MAGAZINES, INC., EXECUTIVE AND EDITORIAL OFFICES, 855 AVE. OF THE AMERICAS, NEW YORK 1, N. Y. BRyant 9-0497

FEATURES

A Study of Critical Pigment Volume Concentration in Low Luster House Paints, Part I, *by Thomas Ferrigno* 31
Using the excess binder concept, the purpose of this study is to ascertain the effect of CPVC in house paints and the role of extender pigments in such formulations.
Coatings from Cyclohexene Oxide Derivatives, *by C. W. McGary, Jr., C. T. Patrick, Jr., and R. Stickle, Jr.* 39
Properties of such coatings include rapid cure, excellent color retention, hardness, flexibility and resistance to caustic and water.
Program of Southern Paint Meeting 45
The Coating Corner, *by Phil Heiberger* 47

PRODUCTION

Ball Mill Operation, Part I, *by R. H. Jebens* 53
Author discusses characteristics of ball mills and grinding balls, and the importance of pigment particle size and consistency as they apply to ball mill operation.
Statistical Methods, Part I—Fundamentals, *by Lawrence Shatkin* 59
New Developments 62
New Equipment and Raw Materials 67
Patents 70
Technical Bulletins 74

AEROSOL COATINGS

Paint Aerosols and Public Regulations, *by E. G. Roberts* 81
A discussion of regulations governing the packaging, shipping and labeling of aerosol paints.
Effect of Fluorocarbon Propellents and Methylene Chloride on Various Plastics, *by James A. Brown* 86

DEPARTMENTS

Comment 7
News 94
Calendar of Events 100
Personnel Changes 102

In Our 50th Year

NEXT ISSUE

Trimethylolpropane and its use in alkyd resins will be featured in the April issue. This article covers formulations and cooking procedures and other general information characterizing the use of trimethylolpropane in alkyds.

PAINT and VARNISH PRODUCTION is published monthly except semi-monthly in March at Easton, Pa., by Powell Magazines, Inc., John Powell, president; Ira P. MacNair, vice-president and treasurer; Alan P. Danforth, vice-president; Alice L. Lynch, secretary. Entered as second class matter at Post Office at Easton, Pa., Jan. 30th, 1952, under the Act of March 3, 1879. SUBSCRIPTION RATES POSTPAID: *United States and Canada*, 1 year $4.00; 2 years $7.00. *Mexico and Pan-American Countries*, 1 year $5.00; 2 years $8.00. All other countries, 1 year $8.00; 2 years $15.00. Remit cash in advance, with order, by bankers draft on New York funds. SINGLE COPIES: *Current issue:* $0.50; *all back numbers:* $1.00. Convention issue: $1.00. Review and Buyers' Guide: $5.00. Bound volumes: $15.00 per vol. when available. We cannot guarantee to supply back numbers and claims for missing numbers cannot be granted if received more than 60 days after date of mailing. Subscribers should promptly notify circulation department of any change in address, giving both old and new addresses and by sending address label. EDITORIAL AND EXECUTIVE OFFICES: 855 Avenue of the Americas, New York 1, N. Y. BRyant 9-0497. Printed in U. S. A.

for the Paint, Varnish, and Lacquer industry

solvents

acetone
ethyl acetate
isopropyl acetate
isobutyl acetate
n-butyl acetate
2-ethylisohexyl acetate
isobutyl alcohol
2-ethylhexyl alcohol
Tecsol®
(95% proprietary ethyl alcohol)

film formers

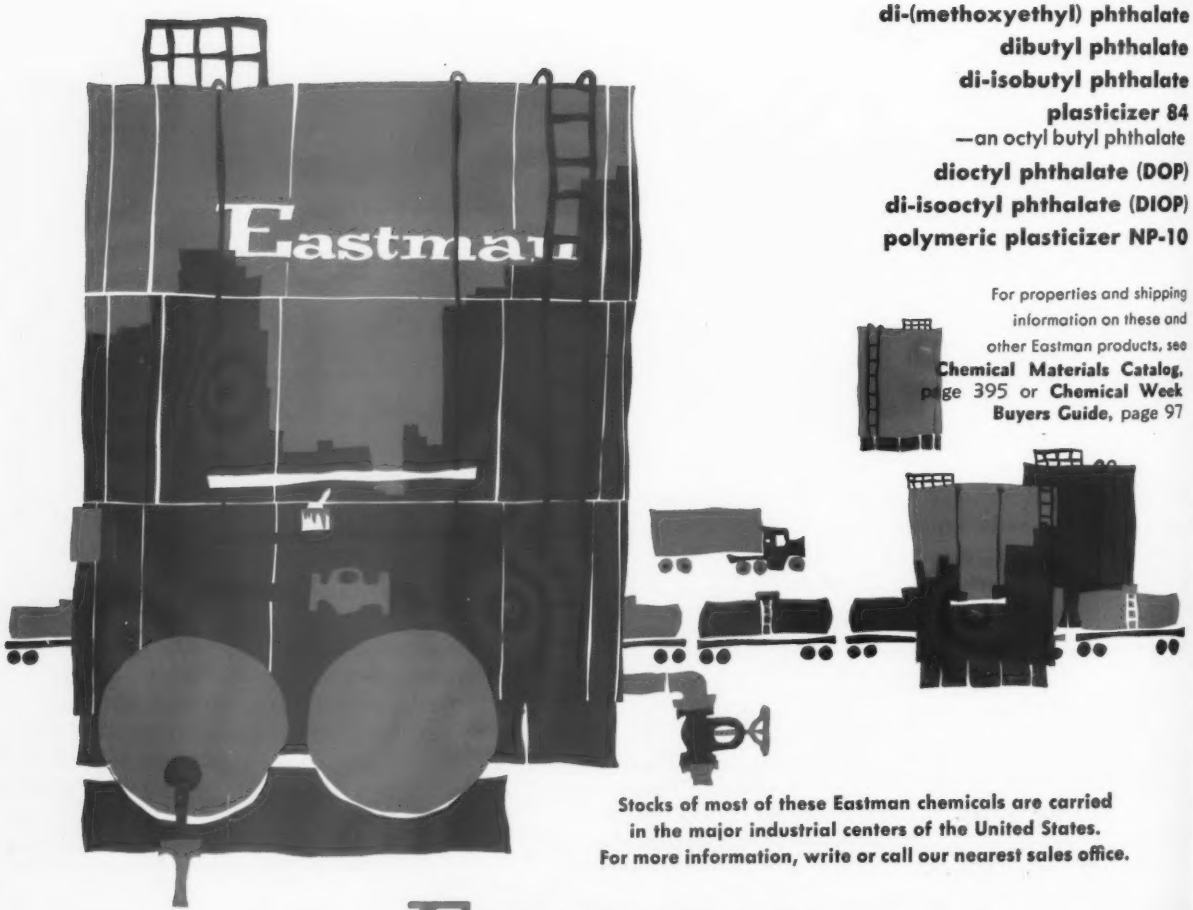
cellulose acetate
cellulose acetate butyrate

modifier

sucrose acetate isobutyrate (SAIB)

plasticizers

dimethyl phthalate
diethyl phthalate
di-(methoxyethyl) phthalate
dibutyl phthalate
di-isobutyl phthalate
plasticizer 84
—an octyl butyl phthalate
dioctyl phthalate (DOP)
di-isooctyl phthalate (DIOP)
polymeric plasticizer NP-10



For properties and shipping information on these and other Eastman products, see **Chemical Materials Catalog**, page 395 or **Chemical Week Buyers Guide**, page 97

Stocks of most of these Eastman chemicals are carried in the major industrial centers of the United States. For more information, write or call our nearest sales office.

Eastman CHEMICAL PRODUCTS, INC.

KINGSPORT, TENNESSEE, subsidiary of Eastman Kodak Company

SALES OFFICES: Eastman Chemical Products, Inc., Kingsport, Tennessee; Atlanta; Chicago; Cincinnati; Cleveland; Framingham, Massachusetts; Greensboro, N. C.; Houston; New York City; St. Louis. **West Coast: Wilson Meyer Co.,** San Francisco; Los Angeles; Portland; Salt Lake City; Seattle.

EDITORIAL COMMENT

A New Market for Latex

WITHIN the next few weeks the big push in promoting the use of latex paints for exterior surfaces will be in full swing. Eager to grab a share of the 50 million gallons a year exterior market, producers of these new paints look to the "do-it-yourself" consumer for a major part of their sales. With such claimed features as non-blistering, high durability, quick-drying, and easy application and clean-up properties, such paints are bound to have considerable consumer appeal.

Producers of such paints, recognizing that application instructions must be adhered to the letter for these paints to perform successfully on exterior wood surfaces, have gone to great lengths to impress the user on this one point. For example, one manufacturer has this warning printed on the lid of each can:-

"Use this unusual new paint as directed or please don't use it."

Another firm places a little booklet on the top of each can of paint which explains to the customer how the product should be used properly. Others have special instructions printed on the label of the can.

It is interesting to note that most instructions stress the importance of using an oleoresinous primer on new wood and previously painted surfaces which are in poor condition. Some recommend the addition of a drying oil (10-20%) to the latex in order to get good adhesion over chalking surfaces. In some respects the idea of using an oil primer has taken some of the glamour out of these latex products, but most manufacturers feel that the product itself has many good features which overshadow the primer requirement. Some feel the answer to this merchandising problem lies in the development of a satisfactory water-based system—primer and top coat.

In any event latex paints for exterior wood application have made their debut and if their growth follows the pattern set by interior latex paints, a rosy future is in store for them.

A Good Year

FIGURES just recently released from the Bureau of Census show that 1959 set a new record for paint sales.

Total sales reached an all-time high of some $1,782,200,000 which is an increase of 9.4% over the previous record of $1,629,300,000.

A break-down of this volume showed that trade sales hit a high of $1,056,400,000—the first time in history this segment passed the billion dollar mark. Of particular interest was the showing industrials made in 1959. With a gain of 14.5% over 1958, industrials pushed to an all-time high of $725,800,000 over the previous 1955 record of 649,641,000—an indication that the nation's industrial productivity remained at high levels despite the steel strike.

This year the paint industry is shooting for a two billion dollar volume. To achieve this target, the volume for 1960 must exceed the 1959 total by some 218 million dollars. Can the paint industry do it?

has widespread applications

This basic, versatile chemical is used in the formulations of

RESINS • PHARMACEUTICALS
FERTILIZERS • CHEMICALS
PLASTICS
AND IN MANY OTHER FIELDS

GRACE . . . a major source . . . has "A WORLD OF EXPERIENCE" in producing urea of uniform purity and quality...

GRACE A WORLD OF EXPERIENCE

Write for samples, specifications and further information.

Grace Chemical Company
A DIVISION OF W. R. GRACE AND COMPANY
MEMPHIS, TENN.

SALES OFFICES:
Edway Building, Memphis, Tenn., Phone: JAckson 7-1551 • New York District Office, 3 Hanover Square, Phone: DIgby 4-1200 • Chicago District Office, 75 E. Wacker Drive, Phone: FRanklin 2-6424 • Tampa District Office, 2901 Alline Avenue, Phone: 63-4121.

PVP PAINT AND VARNISH PRODUCTION

Serving Administration and Technical-Production Management of Coatings Manufacturing Plants

Published monthly by
POWELL MAGAZINES, INC.
855 Ave. of the Americas
New York 1, N. Y.
BRyant 9-0497

PUBLISHER
JOHN POWELL

EDITOR
ANTHONY ERRICO

EDITORIAL STAFF
Marvin C. Feinstein, *Assistant Editor*
J. P. Danforth, *Art Editor*
Lawrence Shatkin, *Production*
Vladimir Slamecka, *Foreign*
E. G. Roberts, *Aerosol Coatings*
W. Philip Leidy, *Editorial Assistant*

BUSINESS STAFF
Alan P. Danforth, *General Manager*
Abraham Mann, *Production Manager*
Harold C. Kinnaman, Jr., *Circulation Manager*
K. Elaine Mullin *Advertising Service*

ADVERTISING SALES STAFF
Philip J. Seavey, *Advertising Manager*

New York
Powell Magazines Inc., 855 Ave. of the Americas, New York 1, N. Y. BRyant 9-0497

Chicago
William Cook, Russell Henriquez. c/o W. A. Cook & Associates, 161 E. Grand Ave., Chicago 11, Ill. SUperior 7-9420

West Coast
San Francisco: Morton McDonald, c/o McDonald-Thompson Company, 625 Market St., San Francisco 5, Calif. YUkon 1-2245

Branch Offices of McDonald-Thompson Co.—Los Angeles, Calif., Denver, Colo., Portland, Ore., Seattle, Wash., Houston, Tex., and Dallas, Tex.

MEMBER BUSINESS BPA PUBLICATIONS AUDIT, INC

A Titanium Dioxide for Latex Paints should give BOTH Fast Dispersion and Maximum Hiding Power

HORSE HEAD PRODUCTS ®

HORSE HEAD® TITANIUM DIOXIDE

R-750

And that's just what you can expect . . . and what you will get . . . if you select Horse Head R-750 titanium dioxide for your latex formulas.

Horse Head R-750 disperses rapidly and completely in water, using any of a variety of wetting and dispersing agents. It is low in water-soluble salts, too, to provide the stability you need in finishes of this type.

As for hiding . . . it is unexcelled . . . because Horse Head R-750 has optimum particle size as well as maximum rutile refractive index. You won't have to sacrifice any hiding to get your fast dispersion.

Prove it to yourself. Try Horse Head R-750 – the titanium dioxide designed specifically for latex emulsion paints. Take in a shipment and make a production batch.

THE NEW JERSEY ZINC COMPANY 160 Front Street, New York 38, N.Y.

founded 1848

BOSTON • CHICAGO
CLEVELAND • OAKLAND
LOS ANGELES

Also Distributed by
VAN WATERS AND ROGERS SEATTLE • PORTLAND (ORE.) • SPOKANE • VANCOUVER, B. C. • DALLAS • HOUSTON
ST. LAWRENCE CHEMICAL COMPANY, LTD. TORONTO, ONT. • MONTREAL, QUE.

HERE'S WHY THEY WANT A "TIME-PROVED" PAINT

Because of a Cargill advertisement, the Joneses now know that only linseed oil paints are *time-proved*—proved by centuries of dependable service. Proved, too, because of extra months and years of protection that linseed oil paints provide. So the Joneses want an exterior paint made with linseed oil.

The Joneses and 165,000 other potential paint customers are reading this ad in the current building annual of BETTER HOMES AND GARDENS. It's Cargill's way of helping you tell homeowners about the dependability of your linseed oil based paints.

And Cargill hasn't forgotten the third person in this picture—the painting contractor. As a major influence controlling the selection of about one fourth of all paint produced, the painting contractor is important to your sales figures, too. A Cargill campaign in AMERICAN PAINTER AND DECORATOR will show him why *time-proved* linseed oil paint helps his business.

Still another advertising campaign, directed at *your* immediate customers, will appear in AMERICAN PAINT & WALLPAPER DEALER. To aid you further in merchandising your paints through your retail outlets, Cargill can provide you in quantity with counter cards and with informative brochures that tell the superiority of linseed oil based exterior paints.

For more information about this Cargill merchandising program, just write:

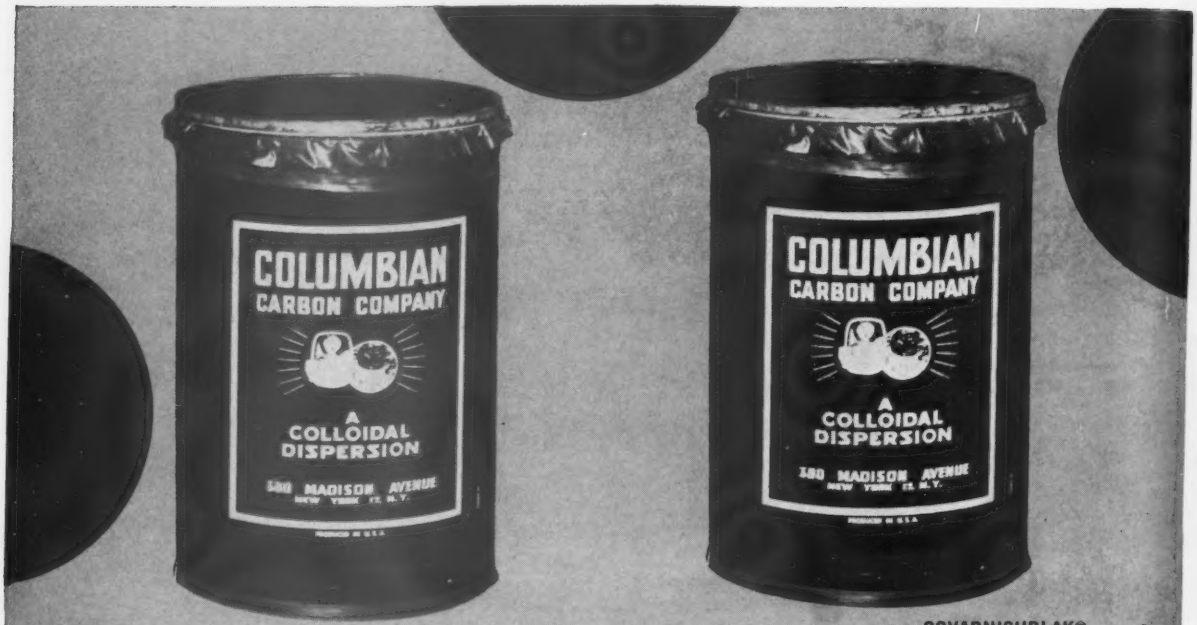
CARGILL

CARGILL, INCORPORATED

200 Grain Exchange, Minneapolis 15, Minnesota, Dept. 101

basic supplier to the coatings industry

PROTECTED...
By America's Paint Manufacturers!
Throughout industry and on the farm, painting with aluminum paint has become a basic part of overall maintenance of buildings and equipment. Much of this paint is formulated with aluminum pigments manufactured by Metals Disintegrating Company, which has been working with and supplying the nation's paint manufacturers for more than 30 years.
MD has developed, over the years, aluminum pastes and powders with a wide variety of surface properties ranging from the priming grades of high brilliance to the extra fine lining grades of chrome-like lustre. Speedy service is assured by 22 nation-wide warehouses and distributors in 30 key cities.
Your local MD Distributor, backed by our laboratory service, is a reliable source of information on technical problems.
MD
PRODUCTS
METALS DISINTEGRATING COMPANY
Division of American-Marietta Company
General Offices, Department F, Elizabeth 8, N. J.



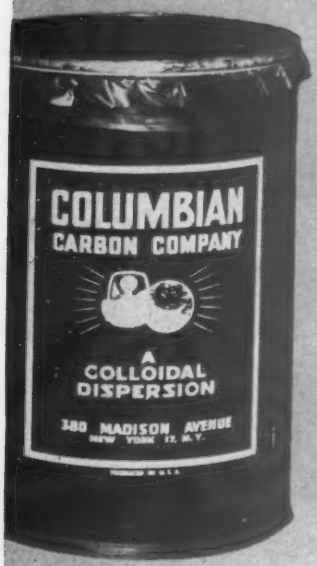
COVINYLBLAK® . . . a colloidal dispersion of carbon black in vinyl resin — chip form.

COVARNISHBLAK® . . . a colloidal dispersion of carbon black in a stable hydrocarbon resin—powder form.

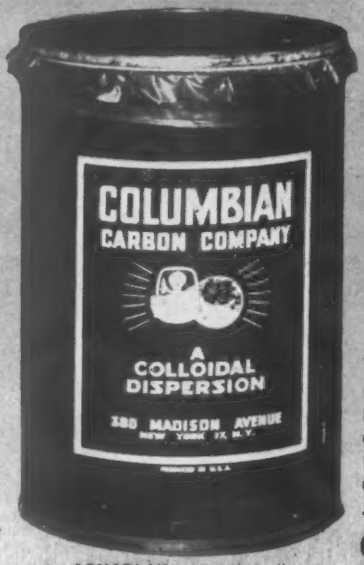
COLUMBIAN . . .

outstanding carbon black dispersions for coatings

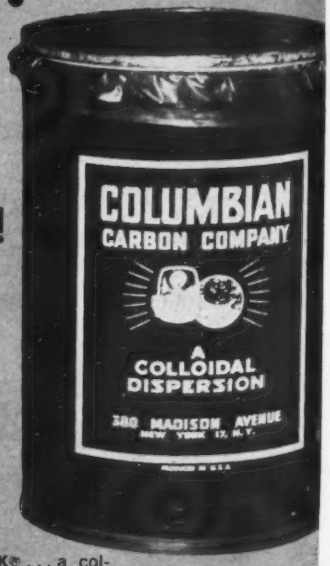
every step of the way!



COBLAC® . . . a complete colloidal dispersion of carbon black in nitrocellulose — chip & paste form.



AQUABLAK® . . . water dispersions of carbon black ready for use without additional grinding or processing.



CORESINBLAK® . . . a colloidal dispersion of carbon black in an alkyd resin base — paste form.

Whatever your need . . . Columbian's predispersed carbon blacks will meet your most exacting requirements efficiently and economically. Columbian dispersions eliminate fear of contamination; are clean, dustless . . . give you unsurpassed quality . . . and end products that mean profits!

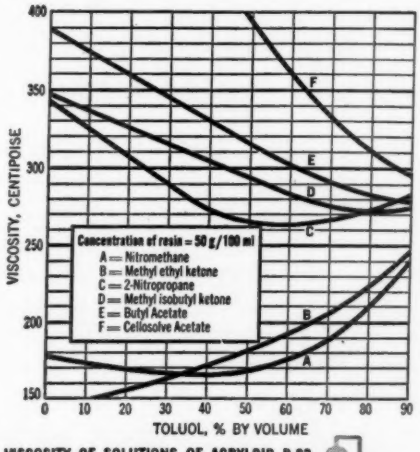
COLUMBIAN CARBON COMPANY
380 Madison Avenue, New York 17, N. Y.

and here are the 4 big reasons why:

- 2-NP has an ideal evaporation rate for spray application. It gives solutions that show less webbing and better break-up.
- With aromatics, 2-NP gives lower solution viscosities than most commonly used solvents.
- Films deposited by 2-NP show excellent solvent release.
- Use of 2-NP reduces cutting time.

Chart to the right shows the excellent solvency characteristics of 2-NP-Toluol blends for the resin B-82. Get the full story on why 2-NP is so outstanding in acrylic resin formulations.

Write for Technical Bulletin No. 8.



VISCOSITY OF SOLUTIONS OF ACRYLOID B-82

INDUSTRIAL CHEMICALS DEPARTMENT

COMMERCIAL SOLVENTS CORPORATION

260 MADISON AVE., NEW YORK 16, N. Y.

Atlanta • Boston • Chicago • Cincinnati • Cleveland • Detroit • Kansas City • Los Angeles • New Orleans
Newark • New York • St. Louis • San Francisco

IN CANADA: McArthur Chemical Co. (1958) Ltd., Montreal • IN MEXICO: Comsolmex, S. A., Mexico 7, D. F.

REGULAR NITROCELLULOSE

DENSE NITROCELLULOSE

SPACE SAVER With new Du Pont Dense Nitrocellulose you get up to 80 additional pounds per drum.

Just Tip and Pour

New free-flowing Du Pont Dense Nitrocellulose makes handling easier and safer

There's no digging, no pitchfork prodding to fray tempers and undermine work schedules when your men unload the new Du Pont Dense Nitrocellulose. It is completely free-flowing at all times—right to the bottom of the drum!

Add to its ease of handling and greater safety the fact that you get a freight and space saving, up to 80 additional pounds per drum, and you have four new reasons for specifying DuPont Dense Nitrocellulose. Field tests show that it goes into solution easily, too.

For complete information and specifications, contact your Du Pont representative or write: Du Pont, Explosives Department, Room 6539 Nemours Building, Wilmington 98, Del.

DU PONT
REG. U. S. PAT. OFF.

DENSE NITROCELLULOSE

Better Things for Better Living . . . *through Chemistry*

The quality line in traffic paints starts with PLIOLITE S-5

If you're interested in producing top-quality traffic paints, see your Goodyear Chemical Division representative.

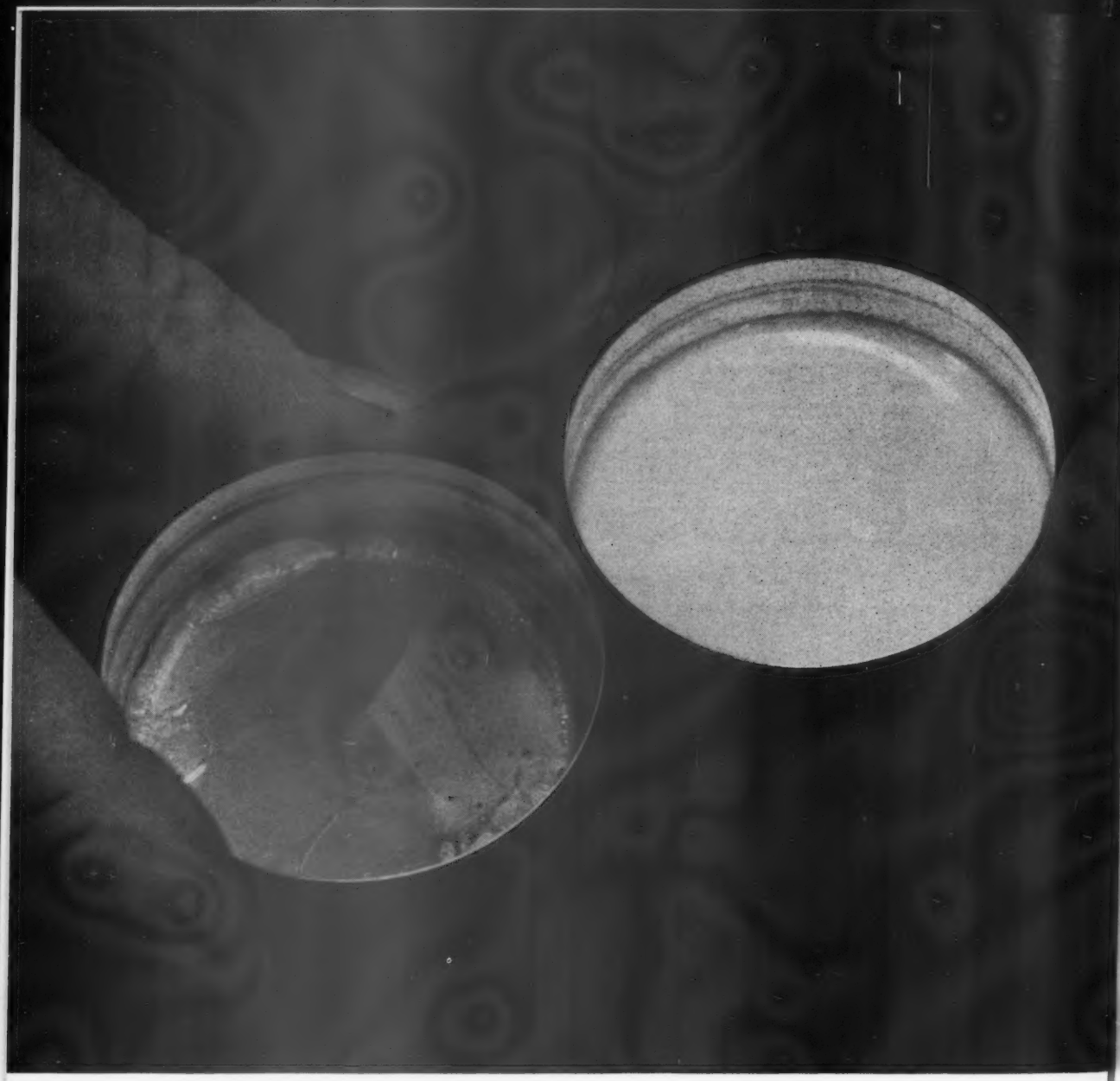
He can tell you all about PLIOLITE S-5 and its advantages in marking paints. Such as: *Fast dry* — stripes are ready for traffic — without tracking — in minutes. *Excellent adhesion* — stripes adhere to road surface longer, retain beads better. *Top chemical- and weather-resistance* — stripes are unaffected by alkalies in concrete or snow-removal chemicals — stand up beautifully in all kinds of weather.

What about cost? Here, too, paints made with PLIOLITE S-5 stand out — have given the lowest cost per foot per day of useful service in case after case. Get all the details on PLIOLITE S-5 from *your* representative. Ask also about PLIOLITE VT. Or write for the latest *Tech Book Bulletins* to Goodyear, Chemical Division, Dept. O-9450, Akron 16, Ohio.

GOODYEAR

CHEMICAL DIVISION

Pliolite—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio



Total solids content is constant in GEN-FLO®

GEN-FLO®

is produced to provide a balance of:

Freeze-thaw stability
Scrubbability
Cleansability
Mechanical stability

Creating Progress Through Chemistry

Chemical Division GENERAL THE GENERAL TIRE & RUBBER CO.

This carefully controlled total solids content in Gen-Flo is of prime importance in assuring uniform and consistent quality in your paint products. This and every one of Gen-Flo's outstanding qualities is tested time and again during its manufacture by skilled technicians to assure its consistent top quality. Let Gen-Flo help you improve your line . . . send for complete information on lab-tested, field-proven Gen-Flo styrene-butadiene latex today!

THE GENERAL TIRE & RUBBER COMPANY
Chemical Division · Akron, Ohio

Chemicals for the rubber, paint, paper, textile, plastics and other industries: **GENTRO SBR** *rubber* **GENTRO-JET** *black masterbatch* • **GEN-FLO** *styrene-butadiene latices* • **GEN-TAC** *vinyl pyridine latex* • **GENTHANE** *polyurethane elastomer* • **ACRI-FLO** *styrene-acrylic latices* • **VYGEN PVC** *resins and compounds* • **KURE-BLEND** TMTD *masterbatch* • **KO-BLEND** *insoluble sulfur masterbatch*

EAGLE-PICHER PERMOX 1·4·3

ONE-FOR-THREE
(Basic Lead Silico-Chromate[1])

CONFORMS TO ASTM SPECIFICATION D-1648

Specification sheets may be obtained by writing ASTM, 1916 Race St., Philadelphia 3, Penn.

AMERICAN SOCIETY FOR TESTING MATERIALS
1916 RACE ST., PHILADELPHIA 3, PA.

A Reprint from Copyrighted A.S.T.M. Publications

Tentative Specifications for

BASIC LEAD SILICO-CHROMATE[1]

ASTM Designation: D 1648 – 59 T

ISSUED. 1959.[2]

These Tentative Specifications have been approved by the sponsoring committee and accepted by the Society in accordance with established procedures, for use pending adoption as standard. Suggestions for revisions should be addressed to the Society at 1916 Race St., Philadelphia 3, Pa.

Scope

1. These specifications cover the pigment commercially known as basic lead silico-chromate.

Composition and Properties

2. (*a*) *Pigment.*—The pigment shall consist of silica coated with lead silicates and lead chromates and shall con- ... the following requirement...

reference sample mutually agreed upon by the purchaser and the seller.

Number of Tests

3. Two samples shall be taken at random from different packages from each lot, batch, day's pack, or other unit of production in a shipment. Whe... no marking ...guishing ... units ...

WRITE FOR FURTHER INFORMATION

Since 1843

EAGLE EP PICHER

THE EAGLE-PICHER COMPANY

Dept. PVP3, Cincinnati 1, Ohio

Regional sales offices: Atlanta, Chicago, Cleveland, Dallas, Kansas City, New York, Philadelphia, Pittsburgh

West Coast sales agent: THE BUNKER HILL COMPANY, Chemical Products Division
Seattle • Portland • Oakland • San Francisco • Los Angeles • Kellogg, Idaho

turning a mountain inside out

Outside, all you can see is the soil and the trees rising sharply against the bright blue of the north Georgia sky.

Inside—action. Men and their machines are dwarfed by the giant pillars of marble, brief profiles against the huge vaulted rooms.

A mountainous mass of magnificent stone—the world's finest crystalline marble—is being turned inside out. Marble—blasted and shoveled and hauled by the truckload—brought out to be crushed and ground into reinforcing structural pigments for the paint industry.

The products: GAMACO*—GAMAKAL—CALWHITE*—KALMAC* 5-25—#10 WHITE—WINGDALE WHITE. The results: they help obtain high pigment loading while contributing to good color retention, enamel hold-out, scrubability, exterior durability, pH stability and mildew resistance.

One or more is just right for your formulations.

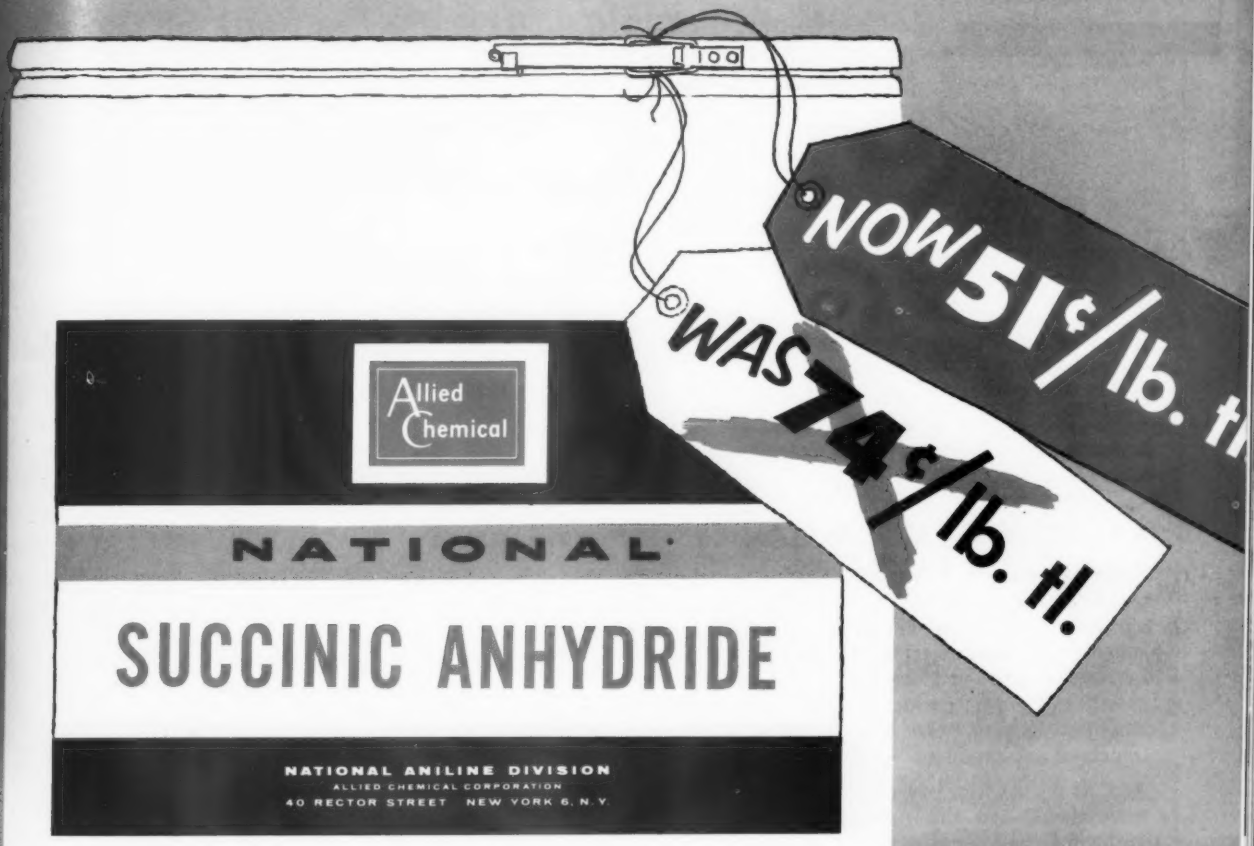
We'll be glad to show you exactly why and how.

CPD CALCIUM PRODUCTS DIVISION

THE GEORGIA MARBLE COMPANY, TATE, GEORGIA

**registered trademarks of The Georgia Marble Company*

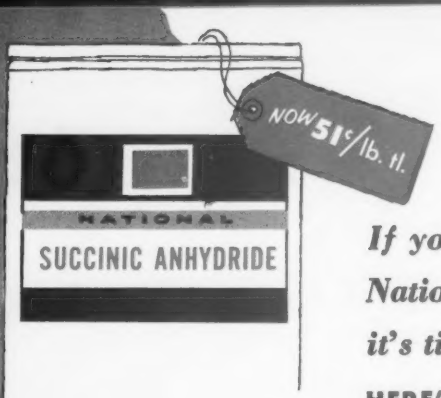
Important Price Reduction!



New low "incentive price" offered to stimulate volume use in coatings, resins, plasticizers, elastomers, adhesives, etc.

Future substantial price reductions probable if consumption grows as contemplated.

READ FULL DETAILS OF HOW YOU CAN BENEFIT



If you have considered National SUCCINIC ANHYDRIDE too costly for your use, it's time now to take another look!

HERE'S WHY...

We are so sure that National SUCCINIC ANHYDRIDE should and can be a major intermediate that we are underwriting future volume with a very attractive "incentive price" *now*.

Even more important, your volume use can help bring additional price reductions that will make the ultimate cost of using this reactive organic comparable to that of other widely used resin chemicals.

So you have every reason to re-examine National SUCCINIC ANHYDRIDE *now*. We'll make it easy for you to do so!

WHY NATIONAL SUCCINIC ANHYDRIDE?

National SUCCINIC ANHYDRIDE has an unusually interesting molecular structure — what researchers colloquially call a "small molecule" — that imparts many desired properties to coatings, resins and plasticizers. At our new low "incentive price" (and with anticipated future reductions based on substantial increased consumption), it can be the basis for many improved end-products.

And, at its new low price, National SUCCINIC ANHYDRIDE should now find increasingly important use in pigments, pharmaceutical intermediates, cosmetic ingredients, perfume bases, corrosion preventives, photographic chemicals, lube oil additives, insect repellents and the like.

Its reactions commend re-study by those who work with esters, acyl compounds, lactones, pyrroles as well as intermediates leading to five-membered cyclic structures.

WHAT IS NATIONAL'S POSITION?

National is America's only producer of SUCCINIC ANHYDRIDE for sale. We have long experience, integrated production and efficient manufacturing processes.

For new users, we can promptly supply laboratory and pilot-plant quantities from our present production. Additional capacity should be on stream in the near future.

We are prepared to install ever-increasing capacity with cumulatively decreasing costs to make National SUCCINIC ANHYDRIDE a major resin chemical as well as an important economic organic intermediate.

WHAT YOU SHOULD DO NOW

Be sure your Research, Product Development and Marketing people see this announcement. Discuss it with them.

Find out what National SUCCINIC ANHYDRIDE at 51¢/lb. can do to increase your sales and open new product opportunities.

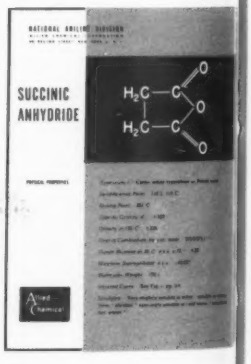
Check what possible future substantial price reductions (based on increased consumption) can do to further increase your sales and profits.

Then — let us know your anticipated needs so we can work with you.

Research & Product Development Men:

HERE'S THE TECHNICAL DATA YOU NEED

Our 40-page Technical Bulletin I-11 SUCCINIC ANHYDRIDE contains complete physical properties, all important reactions, infrared absorption spectrogram, suggested uses and a bibliography of 302 references — all the fundamental data needed for your investigations. Ample working samples will be sent without charge. Use the convenient coupon below for prompt action.



Please send_____copies of your Technical Bulletin I-11-SUCCINIC ANHYDRIDE

☐ Please send working sample

☐ Have representative call by appointment

Name_____ **Title**_____

Company_____

Address_____

Allied Chemical

NATIONAL ANILINE DIVISION
40 Rector Street, New York 6, N. Y.

Atlanta Boston Charlotte Chicago Greensboro Los Angeles
Philadelphia Portland, Ore. Providence San Francisco
In Canada: ALLIED CHEMICAL CANADA, LTD., 100 North Queen St., Toronto 18
Distributors throughout the world. For information:
ALLIED CHEMICAL INTERNATIONAL • 40 Rector St., New York 6, N. Y.

The Case of The
LUCKY LAWSUIT
IS SOMETHING WRONG, MR. SMITH?
PLENTY! SOME OF THE SOLVENTS I'VE BEEN BUYING HAVE BEEN CONTAMINATED! IF THIS KEEPS UP, WE MAY BE SUED!
I WONDER IF THE PROBLEM COULD BE THAT THE SOLVENT DID NOT COME DIRECT FROM THE REFINERY.
PURCHASING AGENT
WAIT A MINUTE! THAT AD I READ...
GET ME THE SKELLYSOLVE PEOPLE IN KANSAS CITY
SWIPE!
SKELLYSOLVE SHIPMENTS ARE MADE DIRECT FROM OUR REFINERY AND THERE'S NO CHANCE OF CONTAMINATION.
...SKELLYSOLVE PUMPS, LOADING LINES, STORAGE TANKS AND TANK CARS ARE USED ONLY FOR SKELLYSOLVE!
...AND 9 OUT OF 10 CARS OF SKELLYSOLVE ARE SHIPPED THE DAY AFTER THE ORDER IS RECEIVED?
GREAT! SHIP US A TANK CAR RIGHT NOW!
MINUTES LATER
HERE'S A WIRE FROM ACME, MR. SMITH!
TELEGR
MONTHS LATER
TELEGRAM
MANY THANKS FOR PROMPT, TOP QUALITY DELIVERIES. DOUBLE NEXT MONTH'S ORDER
ACME COMPANY
GOLLY! THAT NEAR LAWSUIT TURNED OUT LUCKY FOR YOU!
IT SURE DID!
THANKS TO SKELLYSOLVE!

Many companies in your industry depend on Skellysolve for exacting quality, prompt shipment, and uncontaminated products. For complete facts contact us at LOgan 1-3575, Kansas City, Mo.

Skellysolve for Paint, Varnish and Lacquer Manufacture

SKELLYSOLVE-L. A quick-evaporating lacquer diluent of exceptionally sweet odor. Closed cup flash point about 12° F.

SKELLYSOLVE-S. Low end point mineral spirits for thinning paints, varnishes, and polishes. Closed cup flash point about 103° F.

SKELLYSOLVE-S2. A quick-evaporating mineral spirits. Closed cup flash point about 101° F. Excellent for industrial paints and for polishes and waxes.

SKELLYSOLVE-V. Narrow boiling range V.M.&P. naphtha. Excellent for dip and spray enamels. Closed cup flash point about 50° F.

SKELLYSOLVE-T. High boiling mineral spirits for longer, wet edge. Closed cup flash point about 140° F.

SKELLYSOLVE-X. A heavy, slow drying naphtha having a high flash point. Used to increase the wet edge time, to give better flow and leveling characteristics tending to eliminate brush and lap marks in hot weather.

Ask about our Skelly Petroleum Insoluble Grease and wide range of aromatics.

SKELLY Skellysolve

SKELLY OIL COMPANY
TULSA, OKLAHOMA
Industrial Division:
605 West 47th Street, Kansas City 41, Mo.

Huber announces most complete range of kaolin extenders

It is now possible to get the most extensive range of kaolinites (aluminum silicates) from one source. Only Huber kaolin extender pigments are specially prepared by three different methods of refinement and fractionation: *Dry Refined... Washed... Calcined.*

Mystery Taken Out of Identifying Products

For the first time, it is easy to identify extender pigments —saving time and error. For example, Huber #35 indicates that 35% of particles are under two microns in diameter.

Controlled Properties

The Huber aluminum silicates promote ease of flow, film durability and uniform flatting in all paints. The patented VISCONTROL process assures viscosity uniformity from shipment to shipment.

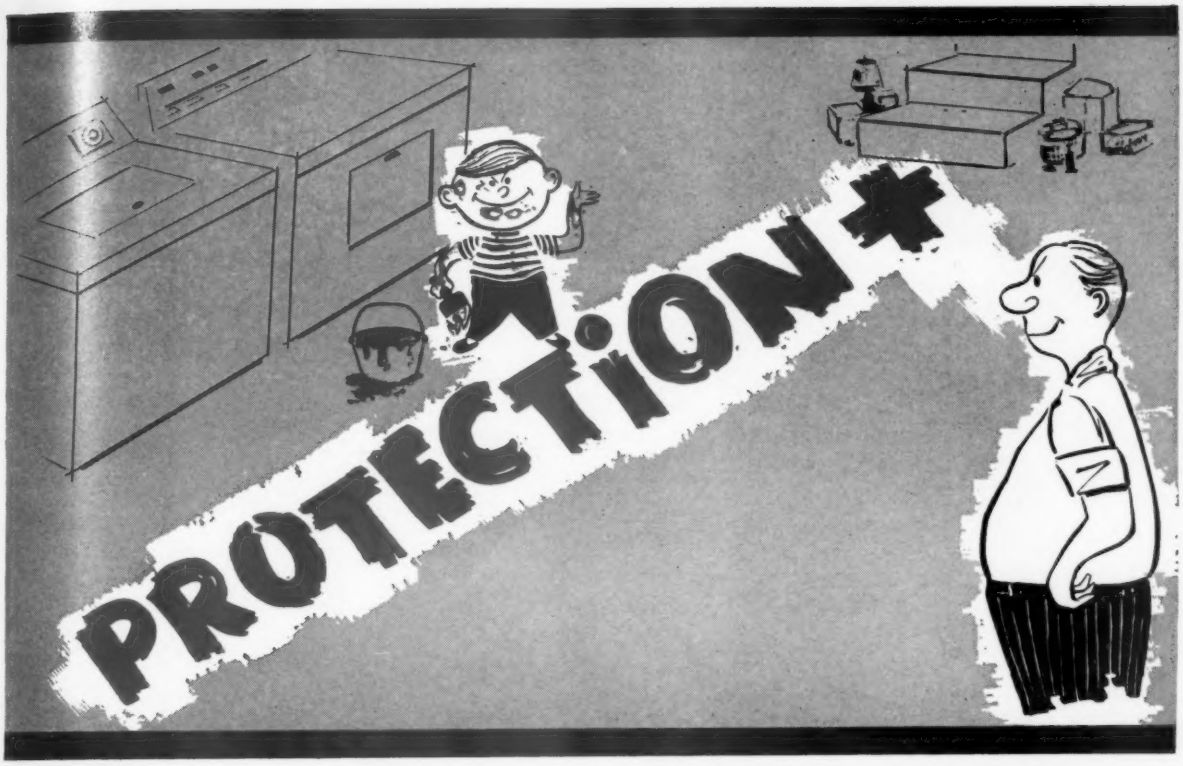
Huber also makes Carbon Blacks and synthetic Zeolex, an excellent flattening and thickening agent.

We will be pleased to send you our new Extender Pigment bulletin, as well as samples of Huber Extender Pigments. Just let us know your requirements.

J. M. HUBER CORPORATION
630 Third Avenue New York 17, N. Y.

HUBER

Are you seeing this informative quarterly magazine? We will be glad to send you a copy if you will write us on your letterhead.



NOW! OFFER "PROTECTION-PLUS" IN CONCRETE FLOOR PAINT MADE WITH

MARBON 9200®

Soluble High Styrene Paint Resin

- Resists acid
- Resists alkali
- Not harmed by oil or grease
- Bars water vapor
- Dries rapidly
- Permits wide range of colors, flexibilities, and degrees of hardness

Paint made with Marbon 9200 gives concrete floors full protection against acids, fumes, weather and water —*plus* superior brush-on qualities, better coverage, and controlled drying. Marbon 9200 gives an attractive gloss too, and builds a tough film that takes the heaviest traffic in stride. These are all reasons why paints containing Marbon 9200 can do a bang-up job of helping to build your sales.

Marbon 9200 is a unique type of binder that provides long package stability. It is specially designed for simple cold-set stir-in when making all types of paints, from clear lacquer to semi-flat. No cooking equipment needed. Production is fast and economical —to help you keep your prices attractively low.

Get the facts—write today for complete information

MARBON CHEMICAL
WASHINGTON

MARBON CHEMICAL B-W BORG-WARNER

DIVISION BORG-WARNER
WEST VIRGINIA

If you want a fire-retardant paint

ISANO OIL DOES THE JOB

Isano-based paint will blister under heat, forming a layer of insulating air that protects surface, retards charring.

Now a fire retardant paint can be made with a built-in intumescent vehicle. As shown above at right, Isano-based paint will blister when heat is applied, forming a layer of insulating air that protects the surface and retards charring. The same heat will cause ordinary paint film to burn, destroying the surface completely.

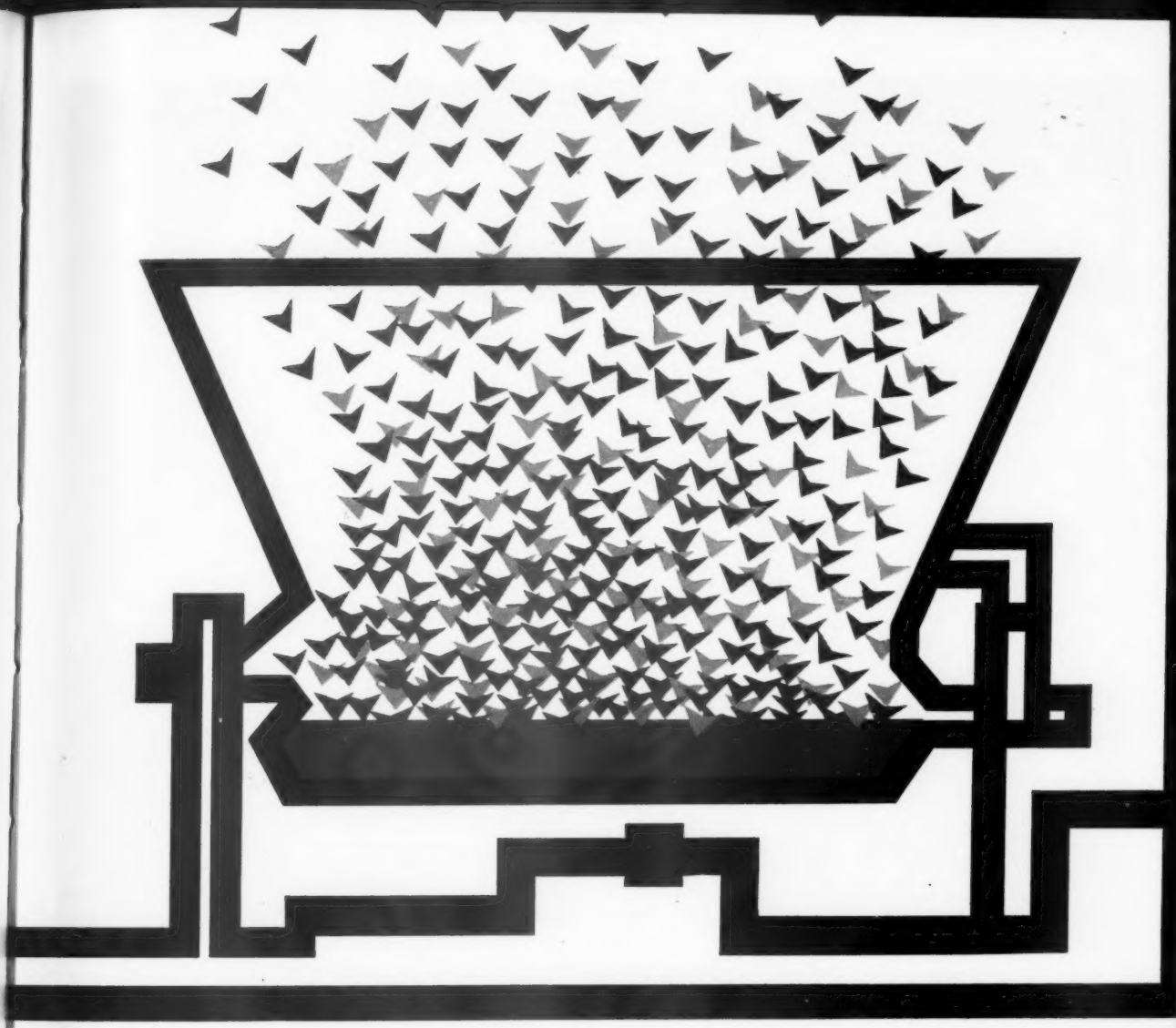
Extremely adaptable, Isano Oil can also be cooked or blended with drying oils or various resins to produce coatings with extreme toughness, high gloss, flexibility and excellent drying characteristics.

For information on Isano formulations in either drying oils or resins, write to:

ATLANTA, GEORGIA
G. R. Nottingham Co.
BOSTON, MASSACHUSETTS
R. B. Huber, Sales Engineer
CHICAGO, ILLINOIS
Daniel G. Herely Co.
CLEVELAND, OHIO
Donald McKay Smith Company
DALLAS, TEXAS
W. W. Richerson Company
DETROIT, MICHIGAN
George E. Moser & Son, Inc.
HOUSTON, TEXAS
Joe Coulson Co.
KANSAS CITY, MISSOURI
Ack Sales Company
LOS ANGELES, CALIFORNIA
Pacific Vegetable Oil Corp.
LOUISVILLE, KENTUCKY
The Argus Co.
MILWAUKEE, WISCONSIN
J. W. Copps
MINNEAPOLIS, MINNESOTA
Horton-Earl Co.
MONTREAL, CANADA
B. & S. H. Thompson & Co., Ltd.
NEW YORK, NEW YORK
Pacific Vegetable Oil Corp.
PHILADELPHIA, PENNSYLVANIA
Baker Industrial Oils Co.
PORTLAND, OREGON
W. Ronald Benson, Inc.
SAN FRANCISCO, CALIFORNIA
Pacific Vegetable Oil Corp.
SEATTLE, WASHINGTON
W. Ronald Benson, Inc.
ST. LOUIS, MISSOURI
Ivan T. Bauman Co.
TORONTO, CANADA
B. & S. H. Thompson & Co., Ltd.

PACIFIC VEGETABLE OIL CORP.

1145 South Tenth Street • Richmond, California



NEW CELANESE PVAc EMULSION

CL-204

GIVES YOU ECONOMY AND HIGH PIGMENT LOADING

Want to produce low cost paints of high pigment volume concentration? You can do this without sacrificing wet or dry film integrity. New Celanese copolymer emulsion, CL-204, has excellent capacity for binding pigments at high pigment loading levels.

Thoroughly field tested, the new vehicle has given excellent results in paints including universal tinting colors. It has performed outstandingly in architectural finishes, including exterior and semi-gloss paints. CL-204 provides clear, flexible films with good blocking and water resistance. It has excellent mechanical and storage stability insured by an emulsification system carefully designed to provide uniform particle size and distribution.

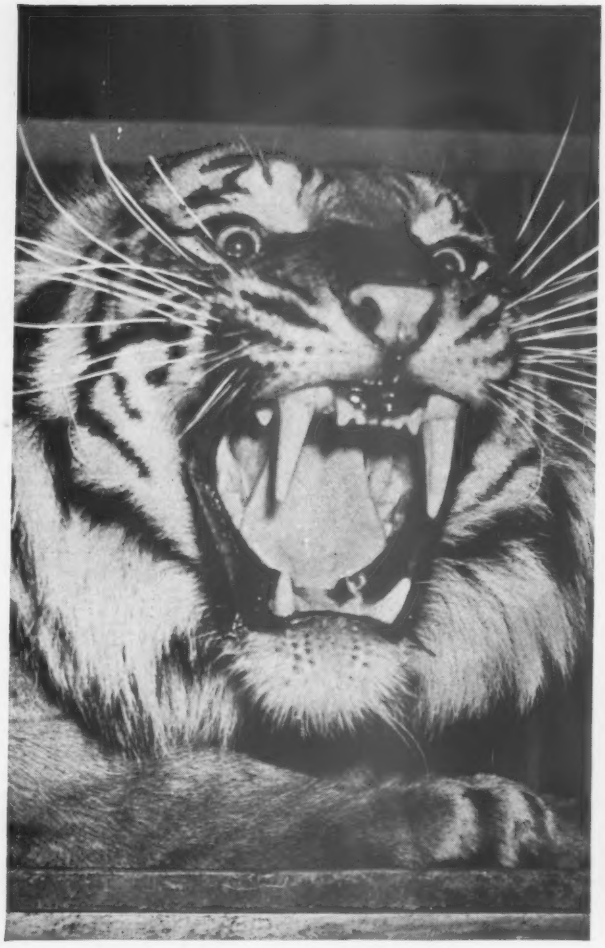
Find out about this new, cost-cutting emulsion. We'll be glad to send you full specifications on CL-204.

Write to: Celanese Chemical Company,
a Division of Celanese Corporation of America,
Dept. 558-C, 180 Madison Avenue, New York 16, N. Y.

Canadian Affiliate: Canadian Chemical Company Limited, Montreal, Toronto, Vancouver.
Export Sales: Amcel Co., Inc., and Pan Amcel Co., Inc., 180 Madison Ave., New York 16, N.Y.

Celanese®

Celanese CHEMICALS...FOR THE PAINT INDUSTRY



They're both cats, but...

each is in a class by itself . . . like Wyandotte's PURECAL® O

You'd never mistake a jungle tiger for a pet kitten . . . but are you as aware of the difference in calcium carbonates?

For, all calcium carbonates are *not* alike. Wyandotte PURECAL O – the calcium carbonate that's in a class by itself – is precipitated by a special process which yields about 20% *more* particles per pound . . . agglomerate-free particles 0.15 micron in size, consistently cubical in shape. What's more, PURECAL O exceeds U.S.P. purity standards, and is a product of *exceptional* whiteness.

For these reasons, replacing prime pigment, such as TiO_2, with up to 10% of PURECAL O in your formulation will maintain brightness and opacity, while actually improving gloss. So you can improve paint formulations while maintaining a given cost level . . . or maintain a given standard while lowering your costs. We invite you to try PURECAL O in your product; write for samples and technical data today. *Wyandotte Chemicals Corporation, Department 754-P, Wyandotte, Michigan. Offices in principal cities.*

Wyandotte CHEMICALS

MICHIGAN ALKALI DIVISION

PACING PROGRESS WITH CREATIVE CHEMISTRY

NEW from Velsicol Research...W-617 HYDROCARBON RESIN EMULSION

A WHOLE NEW PAINT PRODUCT IDEA!

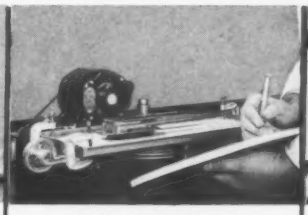
W-617 plus pigments gives you a whole new "miracle" paint product!
COLORFUL PAINT COMPANY
NEW PAINT DISCOVERY
ROLLATONE PAINTS
W-617 adds new features and lowers cost of your present products!
COLORFUL PAINT COMPANY
ONE GALLON
NEW FORMULA
DURATONE

The versatility of Velsicol's W-617 for emulsion base paints makes it the ideal choice for progressive firms seeking profitable new paint products as well as important cost reductions on present products.

THESE PROVEN FEATURES GIVE YOU THE FACTS:

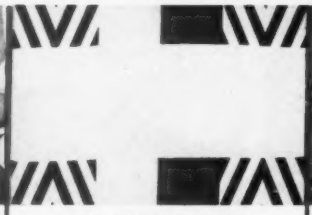
WATER SPOT RESISTANCE

W-617 films have maximum water repellency and minimum re-emulsification advantages created by the non-polar nature of the hydrocarbon base polymer and a specially developed wetting agent system.



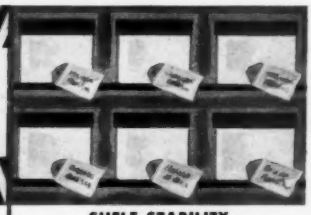
SCRUB RESISTANCE

Pigment binding power plus W-617's water resistance feature makes possible paint films that develop optimum scrub resistance rapidly, giving you a really quick drying and very hard wearing paint film.



TOP HIDING POWER

W-617's high critical pigment volume concentration produces durable films with low specular gloss. Its low angle sheen gives maximum coverage and hiding of under surface imperfections.



SHELF STABILITY

Continuing tests, after 18 months showed that Velsicol W-617 as the sole vehicle or, used with polyvinyl acetate, styrene butadiene or acrylic latexes have good stability properties under standard storage conditions and under the Federal freeze/thaw specifications.

VELSICOL

VELSICOL CHEMICAL CORPORATION
330 East Grand Avenue, Chicago 11, Ill.
International Representative: Velsicol International Corporation, C.A.
P.O. Box 1687 • Nassau, Bahamas, B.W.I.

☐ Please send a test sample of W-617
☐ Please have a salesman call.

PVP-30

Name_____
Company_____
Address_____
City_____ Zone_____ State_____

From Mid-Manhattan

Vinyl Coating provides attractive all weather protection for newly-opened Solomon R. Guggenheim Museum, New York.

Architect Frank Lloyd Wright. Coating materials by R. M. Hollingshead Corp., Camden, N. J.
Applied by Protective Spray Plastics Co., N. Y.

"Bakelite" VINYL RESINS

TO HELP YOU SELL MORE

PROJECT SALESPOWER

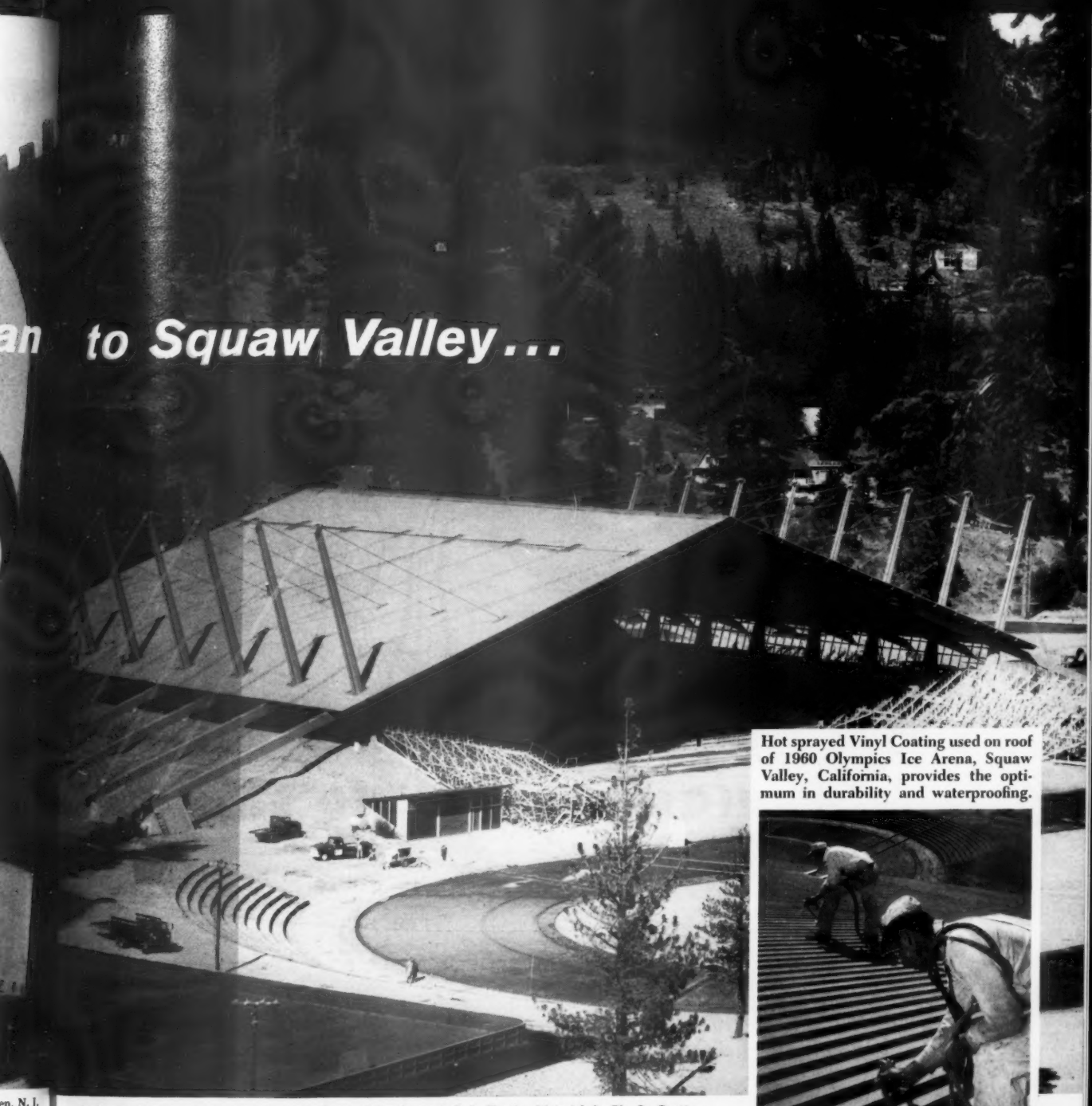
Project Salespower offers you the assurance of better formulations through the use of new materials, new formulations through the systems from the laboratories of UNION CARBIDE.

TO SERVE YOU BETTER

In addition to the regular Union Carbide Plastics distribution points these well known distributors now handle the complete line of BAKELITE Brand Coating Resins:

D. H. Litter & Company, New York 3, N. Y.
Harry A. Baumstark & Co., St. Louis, Mo.
The Cary Company, Chicago, Ill.
Van Horn, Metz and Co., Conshohocken, Pa.

an to Squaw Valley...



Hot sprayed Vinyl Coating used on roof of 1960 Olympics Ice Arena, Squaw Valley, California, provides the optimum in durability and waterproofing.

Architects: Kitchen and Hunt, A. I. A.; Corlett and Spackman A. I. A. Coating Materials by Ply-On Coatings, Inc., San Francisco Applied by Charles E. Gordon Painting Co., San Francisco.

Prove their versatility and acceptance!

IN EACH OF THESE ULTRA MODERN structures the *architect* specified *vinyl* resin coatings because they combine the utmost in protection with lasting good looks. And, in both projects the *contractors* used coatings based on BAKELITE *Vinyl Resins.*

The reasons? *Confidence.*

Confidence by the *architects* in *vinyl* coatings, which have proven themselves for durability and beauty in exterior applications—*many lasting over ten years. Confidence* by the *contractor* in the name BAKELITE—a name recognized by the coatings industry to mean *quality* and *service —for more than 25 years.*

For more information on vinyl coatings or other Project Salespower developments, see your UNION CARBIDE representative or write: Union Carbide Plastics Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, New York. *In Canada:* Union Carbide Canada Ltd., Toronto 7.

UNION CARBIDE

"Bakelite and "Union Carbide are registered trade-marks of Union Carbide Corporation.

The Best of them All!

Truly a Universal Vehicle

PIGMENTS GRIND EASILY

Disperse Completely with Minimum Work

PVA LATEX	ACRYLIC LATEX	STY-BUT LATEX	GLOSS ALKYD	FLAT ALKYD	LINSEED OIL PAINT	NITRO LACQUER	ACRYLIC LACQUER	PLIOLITES	YOU NAME IT

It's Wide Acceptance is It's Best Testimonial!

MINERAL PIGMENTS CORP.

Muirkirk, Maryland

Critical Pigment Volume Concentration in—

LOW LUSTER HOUSE PAINT

By
Thomas H. Ferrigno*

Part I

A series of simplified formulations were based upon Critical Pigment Volume Concentration determinations to establish the effect of the extender in relation to the excess binder content of the system. The excess binder is that quantity of binder expressed as a per cent excess over the binder required at the CPVC of a given blend of pigments. A method was devised for comparing extenders at stated excess binder levels while maintaining all other factors constant.

The results indicate that although the excess binder concept is valid, certain properties related to the extender pigment must be considered as controlling of the ultimate performance of the system. The extender was shown to markedly effect the stability of the paint with age, substrate absorption, application properties, and tannin staining.

CPVC (critical pigment volume concentration) has been the subject of numerous papers,[1,2,3,4,5] but until a recent paper no information had been presented on the role of CPVC in exterior house paints[6]. This latter paper mentioned the use of CPVC as a means for determining the most advantageous pigmentation level in low luster, blister resisting house paints.

Considerable effort has been expended in ascertaining the effects of hiding and reactive pigments in house paints, but the role of extenders has not been so well classified. With these facts in mind the present study was instituted to attain the following objectives:

1. To ascertain the effect of CPVC in house paints using the excess binder concept.
2. To ascertain the role of extender pigments in house paints in relationship to excess binder.
3. To devise a means for comparing extender pigments while maintaining all other factors constant or proportionate in effect.

Theory

The premise upon which this study was based is that at the CPVC each blend of pigments is equalized as to its binder demand. Proportionate excesses of binder beyond the amount required at the CPVC should produce proportionate effects upon paint film properties. By maintaining equal concentrations of all pigments other than the extenders, their effects will be equalized. In substance then, by reducing all other factors to equal or proportionate effects, an evaluation of extenders relative to excess binder can be accomplished.

Program

Shingle and shake paints were selected for study since they are formulated at high PVC's, thus higher proportions of extenders which intensify the extender effect. At higher PVC's then, the blister resistance, viscosity, application characteristics and absorption properties of the paint will be more closely related to the extender.

A coarse particle size, low oil absorption, water ground calcium carbonate, a medium oil absorption, acicular, platey magnesium silicate and a coarse particle, water washed aluminum silicate, ASP

*Research Laboratory, Minerals & Chemicals Corporation of America, Menlo Park, N. J.

400, produced by Minerals & Chemicals Corporation of America, were chosen to provide a broad range in CPVC and to simplify the study. Likewise, a rutile TiO_2 was used in the white paints for simplicity and to emphasize the extender effect on chalking. A companion series employing a free chalking anatase TiO_2 may well have been included but the time available for this study did not permit this variation. An acicular medium low consistency ZnO was chosen as that generally specified for use in lead free house paints. Reactive lead pigments were not included, only to limit the number of variables and not as an oversight. All other materials were of the standard varieties specified for use in house paints.

The following standards were taken for this series of shingles and shake paint formulas:

1. The control paints were formulated at about 40% PVC, which is an average for this type of paint.
2. The vehicle selected was a 60% raw linseed, 40% Z_2 viscosity linseed oil blend. This vehicle was chosen since it contains a high proportion of bodied oil which retards early chalking and color degradation with weathering. This also provided a high viscosity vehicle which reduced paint penetration into substrates.
3. The drier combination selected was 0.8% Pb and 0.04% Mn as naphthenates, calculated as metals on the binder.
4. All paints were prepared by mixing the pastes in the Ross mixer, followed by grinding with the Morehouse mill.
5. Oil absorption determinations were planned using the linseed oil blend common to all paints to determine the CPVC of pigment blends, as cited in the literature.[2] The blend of oils was used to eliminate differences which might result from making a standard oil absorption measurement using refined linseed oil.
6. Excess binder levels were chosen to limit the number of paints studied consistent with sufficient variation to provide a basis for analysis.

TABLE I

CONTROL PAINT FORMULAS

All figures in pounds per 100 gallons of paint

Composition:	White	Red	Yellow
Common Ingredients			
Raw Linseed Oil	208	261	176
Z_2 Linseed	138.5	87	117
Mineral Spirits	163	168	220
24% Pb Drier	11.5	11.5	9.7
6% Mn Drier	2.3	2.3	2.0
Anti-skin Agent	1.3	1.3	1.3
Rutile TiO_2	175	.....	.....
ZnO	174	174	174
Pure Iron Oxide	...	62	...
Med. Chrome Yellow	...	...	100

Extender:		Formula No.		Formula No.		Formula No.
ASP 400	449	12-29-1	536	12-30-1	468	12-44-1
$CaCO_3$	470	12-29-4	561	12-30-4	492	12-44-2
Mg Sil	483	12-29-5	578	12-30-5	505	12-44-3

TABLE II

CHARACTERISTICS OF CONTROL PAINTS

Formula Nos.	Extender	Fineness of Grind N.S.	% PVC	% Excess Binder	Viscosity, KU, 77°F.	Pounds Per Gal.
White						
12-29-1	ASP 400	4.0	40.0	109	92	13.44
12-29-4	$CaCO_3$	4.0	40.0	258	78	13.18
12-29-5	Mg Sil	3.5	40.0	174	87	13.38
Red						
12-30-1	ASP 400	4.5	40.0	131	74	12.79
12-30-4	$CaCO_3$	4.0	40.0	445	66	12.98
12-30-5	Mg Sil	4.0	40.0	224	74	13.07
Yellow						
12-44-1	ASP 400	4.5	42.6	105	77	12.66
12-44-2	$CaCO_3$	4.0	42.6	366	62	12.80
12-44-3	Mg Sil	3.0	42.6	170	71	12.99

TABLE III

CPVC DETERMINATIONS AND RELATED DATA, WHITE PIGMENTATIONS

% Extender Per Pigment Volume	70.5	75.0	80.0	85.0
ASP 400				
% CPVC	58.2	61.4	62.5	....
%PVC, 50% Excess Binder	48.2	51.5	52.6	....
% PVC, 109% Excess Binder	40.0	....	....	....
$CaCO_3$				
% CPVC	70.5	74.5	76.6	78.5
% PVC, 50% Excess Binder	61.5	66.2	68.6	71.0
% PVC, 109% Excess Binder	53.3	58.3	61.0	63.5
Mg Sil				
% CPVC	64.6	66.5	67.8	....
% PVC, 50% Excess Binder	54.9	57.1	58.4	....
% PVC, 109% Excess Binder	46.6	48.7	50.2	....

7. Each series of colors were formulated at equal solids to properly characterize viscosity, cost, blister resistance and absorption.
8. One series of white paints was planned using the pigment composition of the control formulas for each particular extender, but with the vehicle portion calculated to yield a specific excess binder content. This was done to determine the effect of varying the binder with a constant pigment composition.

TABLE IV

CPVC DETERMINATIONS AND RELATED DATA
RED AND YELLOW PIGMENTATIONS

Red Pigmentations:				
% Extender Per Pigment Volume	**7.90**	**82.7**	**85.0**	**90.0**
ASP 400				
% CPVC	60.9	60.6	62.9	64.0
% PVC, 100% Excess Binder	43.8	43.4	45.9	47.0
$CaCO_3$				
% CPVC	....	78.5	81.4	84.4
% PVC, 100% Excess Binder	....	64.6	68.7	73.0
Mg Sil				
% CPVC	....	67.3	71.0	72.2
% PVC, 100% Excess Binder	....	50.7	55.0	56.5
Yellow Pigmentations:				
% Extender Per Pigment Volume	**78.0**	**80.1**	**85.0**	**90.0**
ASP 400				
% CPVC	59.4	60.5	64.6	65.1
% PVC, 100% Excess Binder	42.2	43.4	47.7	48.2
$CaCO_3$				
% CPVC	....	77.6	80.3	83.0
% PVC, 100% Excess Binder	....	63.4	67.1	71.0
Mg Sil				
% CPVC	....	66.8	72.2	72.9
% PVC, 100% Excess Binder	....	50.1	56.5	57.5

TABLE V

CPVC DETERMINATIONS, WHITE OUTSIDE
HOUSE PAINT PIGMENTATIONS

Common Composition:	**% Pigment Volumes**			
Anatase TiO_2, MO	28.7	19.6	14.3	12.1
ZnO	12.2	21.3	26.6	28.8
Extender	59.1	59.1	59.1	59.1
% CPVC vs. Extender:				
BNK	62.3	61.6	60.4	59.6
Asbestine 3X	61.3	61.0	60.3	60.0
Fibrene C-400	61.4	....	....	60.0
Basis: pounds of pigment per gallon of paint:*				
TiO_2	2.3	1.6	1.22	0.9
ZnO	1.4	2.5	3.55	3.1
Classification:	Max TiO_2	Avg. TiO_2	Formula 2-120	Min. TiO_2

*Data from "1956 AZO Survey, Outside White House Paints," American Zinc Sales Co., Columbus, Ohio. Range of ZnO and TiO_2 in regular outside white house paints.

9. Using CPVC values determined by oil absorption, curves of PVC versus the extender volume per total pigment volume as specific excess binder levels were planned. As stated under "Theory," it was considered necessary to maintain equal concentrations of all pigments except the extenders. A curve based upon the same variables at a constant volume per cent of $ZnO+TiO_2$ per total non-volatile content could be plotted simultaneously. At the points of intersection of these two curves the $ZnO+TiO_2$ volume would be constant and the PVC of a paint at a specific excess binder level could be read. (See Appendices I and II for examples of calculations.)

10. A series of CPVC determinations were planned using a conventional white exterior house paint formula[7] as the basis for pigmentation. Three pigments were used in this series; an experimental coarse fraction aluminum silicate, Asbestine 3X and Fibrene C-400. Based upon the range of zinc oxide and titanium dioxide contents used in white house paints, as reported in a recently published survey,[5] additional series with varying TiO_2/ZnO ratios were planned, keeping the extender and total pigment volumes constant. This was intended as a preliminary investigation for future studies of the significance of excess binder in regular outside house paints.

11. Paint characteristics were to be determined according to standard methods.[9]

12. Blister resistance tests were to be run according to the method described in the Experimental Section of the present paper.

13. Absorption tests were to be run in accordance with a standard method.[10] To determine the amount of vehicle absorbed from the paint by No. 1 cedar shakes, 60° gloss tests[11] were to be determined on films of the paints applied on non-absorbent Morest charts and on the cedar shakes. Absorption could then be classified by differences in gloss by this method.

Experimental

Preparation of Shingle and Shake Control Paints

A series of white paints were prepared at PVC's of 40% in accordance with the standards set forth in the Introduction. The series of yellow paints were prepared at 42.6% PVC with the three basic extenders. A series of red paints were also prepared at 40% PVC with 75% raw linseed oil and 25% Z_2 viscosity linseed oil as the vehicle, and 73.69 gallons of non-volatile volume per 100 gallons of paint. The above formulas are reported in Table I, and the paint and formula characteristics in Table II.

Determination of CPVC, Excess Binder and PVC at Constant $ZnO+TiO_2$

The rub-out absorption method for determining the CPVC was used.

The ratio of TiO_2 to ZnO was kept constant at that used in the control formulas for the white paints (Table I, Formula Nos. 12-29-1 to 5), as follows:

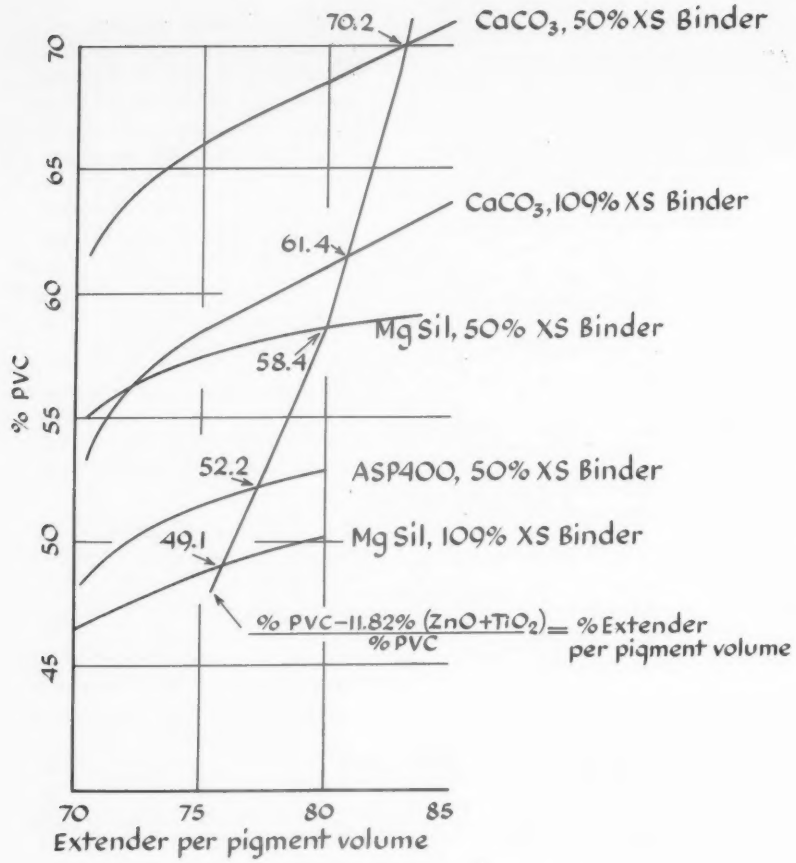


Figure 1. PVC at constant TiO_2 plus ZnO volume per excess binder levels.

	Pounds*	Gallons*	Relative Volume, %
TiO_2	175	5.00	57.3
ZnO	174	3.72	42.7

*Per 100 gallons of paint

Pigment proportions by weight corresponding to a range of extender per total pigment of from 70.5 to 85 volume per cent were calculated, and the indicated pigment blends prepared. Oil absorptions of the blends were determined, and CPVC values calculated from the oil absorptions as follows:

$$\frac{\text{Total Volume Pigment}}{\text{Total Volume Pigment and Oil Volume}} \times 100 = \% \text{ CPVC}$$

The PVC's at a specified excess binder content were calculated from the above as follows:

$$\frac{\text{CPVC}}{100 + (100 - \text{CPVC}) \times \% \text{ Excess Binder PVC at stated } \% \text{ excess binder}} =$$

See example, Appendix I.

The CPVC and the PVC values at 50 and 109% excess binders are listed in Table III. An excess binder of 109% rather than 100% was chosen as one level since this was the excess binder content of the ASP 400 white control paint (Table II, 12-29-1).

The zinc oxide-titanium dioxide volume per total nonvolatile volume in 100 gallons of paint was calculated as follows:

$$\frac{\text{ZnO+TiO}_2 \text{ Volume}}{\text{Total Non-volatile Volume}} \times 100$$

	Pounds	Gallons
TiO_2	175	5.00
ZnO	174	3.72
		8.72

$$\frac{8.72 \text{ Gallons}}{73.69 \text{ Gallons}} = 11.82\%$$

The formulas were calculated using 73.69 gallons of nonvolatile volume per 100 gallons of paint, since this was the non-volatile volume of the white control paints (Table I). Values of extender volume per total pigment volume at this level of ZnO+TiO_2 content were calculated for a series of PVC's according to the following formula (see Appendix II for example):—

$$\frac{\% \text{ PVC} - 11.82\%}{\% \text{ PVC}} = \text{Extender volume per total pigment volume.}$$

Simultaneous graphs of PVC vs. extender volume per total pigment volume at the constant ZnO+TiO_2 content, and at specified excess binder contents are shown in Figure No. 1.

The determined CPVC values and PVC values obtained with 100% excess binder for the red and yellow pigmentations are reported in Table IV.

Graphs of the red and yellow pigmentations with 100% excess binder are shown in Figures 2 and 3, respectively. Also shown are the derivations of PVC for the constant volumes of color pigment +ZnO by the method reported above.

The preliminary investigation of CPVC of outside house paints, as outlined above was conducted by ascertaining minimum and maximum TiO_2 and ZnO concentrations from the literature.[8] The range of concentrations were set up by combining

(a) minimum TiO_2 with maximum ZnO;

(b) the reverse of these;

(c) the averages reported; and

(d) the combination used in the basic formula.[7]

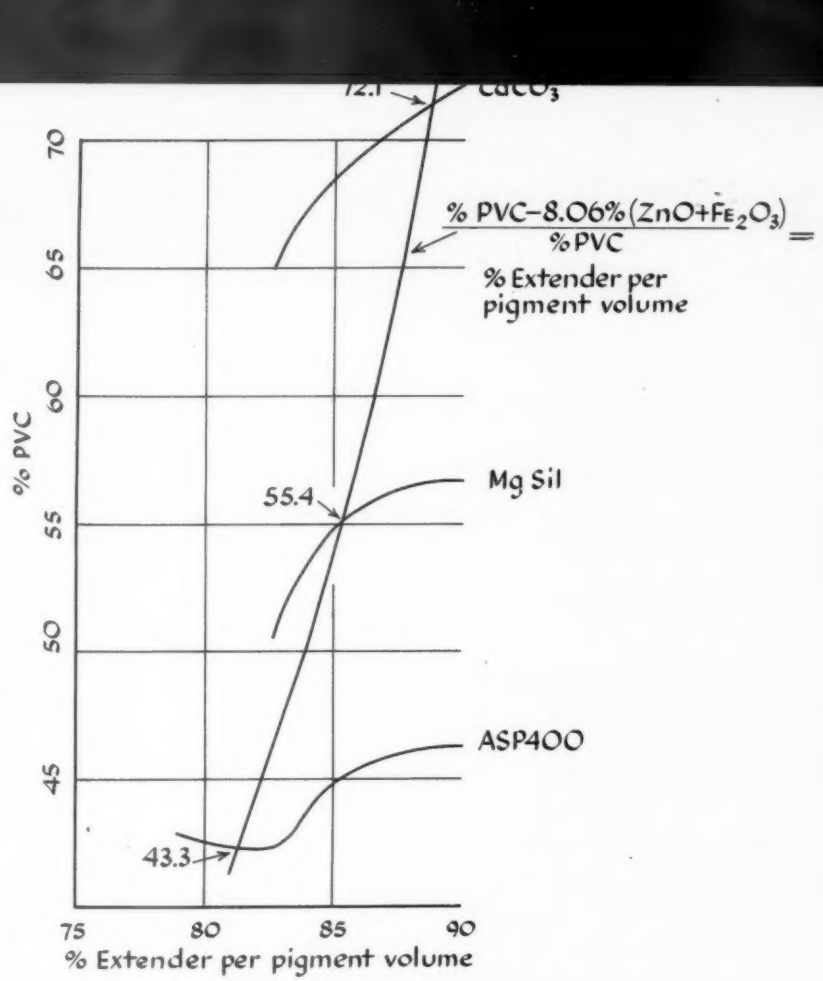
The extender volume of the basic formula (59.1%) was used for each TiO_2+ZnO combination. The CPVC values obtained with three extenders; BNK, Asbestine 3X and Fibrene C-400 are reported in Table V.

Part II, scheduled for the April issue, will cover the preparation of various paints with excess binder content and discuss and compare the blister resistance, absorption, and brushing and leveling characteristics of these specially formulated paints.

Bibliography

(1) Asbeck & Van Loo, Ind. Eng. Chem., Vol. 41, p. 267, 1949
(2) Stieg & Burns, Official Digest, Vol. 26, p. 81, 1954
(3) Asbeck, Laiderman & Van Loo, Official Digest, Vol. 24, p. 156, 1952
(4) Stieg, Official Digest, Vol. 28, p. 695, 1956
(5) Asbeck, Scherer & Van Loo, Ind. Eng. Chem., Vol. 47, p. 1472, 1955
(6) Whitford, Official Digest, page 846, Sept. 1957
(7) Technical Information No. 208, bulletin published by Minerals & Chemicals Corp. of America.

Figure 2. PVC at constant ZnO plus Fe_2O_3 volume and 100% excess binder.



(8) "1956 AZO Survey, Outside White House Paints," American Zinc Sales Co., Columbus, Ohio

(9) Federal Specification on Testing Methods, TT-P-141b;
Viscosity Method No. 428.1
Weight per Gal. " " 401.1
Fineness of Grind " " 441.1

(10) Fed. Spec. on Testing Methods, TT-P-141b; *Absorption*, Method No. 442.1

(11) Ibid. *Specular Gloss*, Method No. 610.1

APPENDIX I

Calculations for graphing per cent excess binder.

From Table III the per cent CPVC obtained for ASP 400 at 70.5% extender per pigment volume was 58.2% Substituting in the formula:

$$\frac{\text{CPVC}}{100 + (100 - \text{CPVC}) \times \%\text{ excess binder}} = \text{PVC at stated excess binder;}$$

$$\frac{58.2}{100 + (100 - 58.2) \times .50} = 48.2\%\ \text{PVC}$$

The point on the graph (see Figure No. 1) is 48.2% PVC and 70.5% extender per pigment volume. In this manner the curve for ASP 400 at 50% excess binder was plotted.

APPENDIX II

Calculations for graphing constant TiO_2 + ZnO volume per total non-volatile volume.

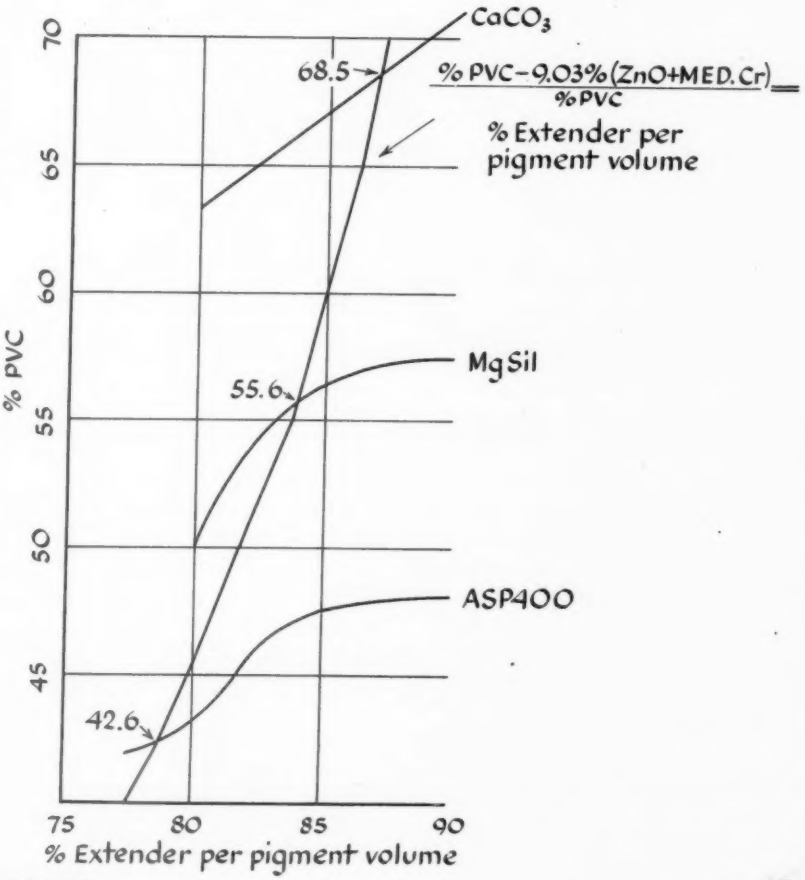
From the calculations shown on Page 34 the ZnO + TiO_2 volume per non-volatile volume was 11.82%. Substituting in the formula:

$$\frac{\%\ \text{PVC} - 11.82\%}{\%\text{PVC}} = \%\ \text{extender per pigment volume}$$

$$\frac{48.0 - 11.82}{48.0} = 75.5\%$$

The point on the graph (see Figure No. 1) was 75.5% extender per pigment volume and 48.0% PVC. In this manner the curve was plotted. At the points of intersection of this curve and per cent excess binder curves, the TiO_2 + ZnO volume per non-volatile volume was constant.

Figure 3. PVC at constant ZnO plus med. Cr volume at 100% excess binder.



Settling? Sagging?

Your paint product won't fall down on the job—no matter what your formulating temperature—if your recipe includes the correct Baker additive.

THIXCIN® R . . . first choice for use at moderate temperatures and with low KB solvents and oil vehicles. M-P-A® . . . first choice for processing at higher temperatures, usable with any solvent.

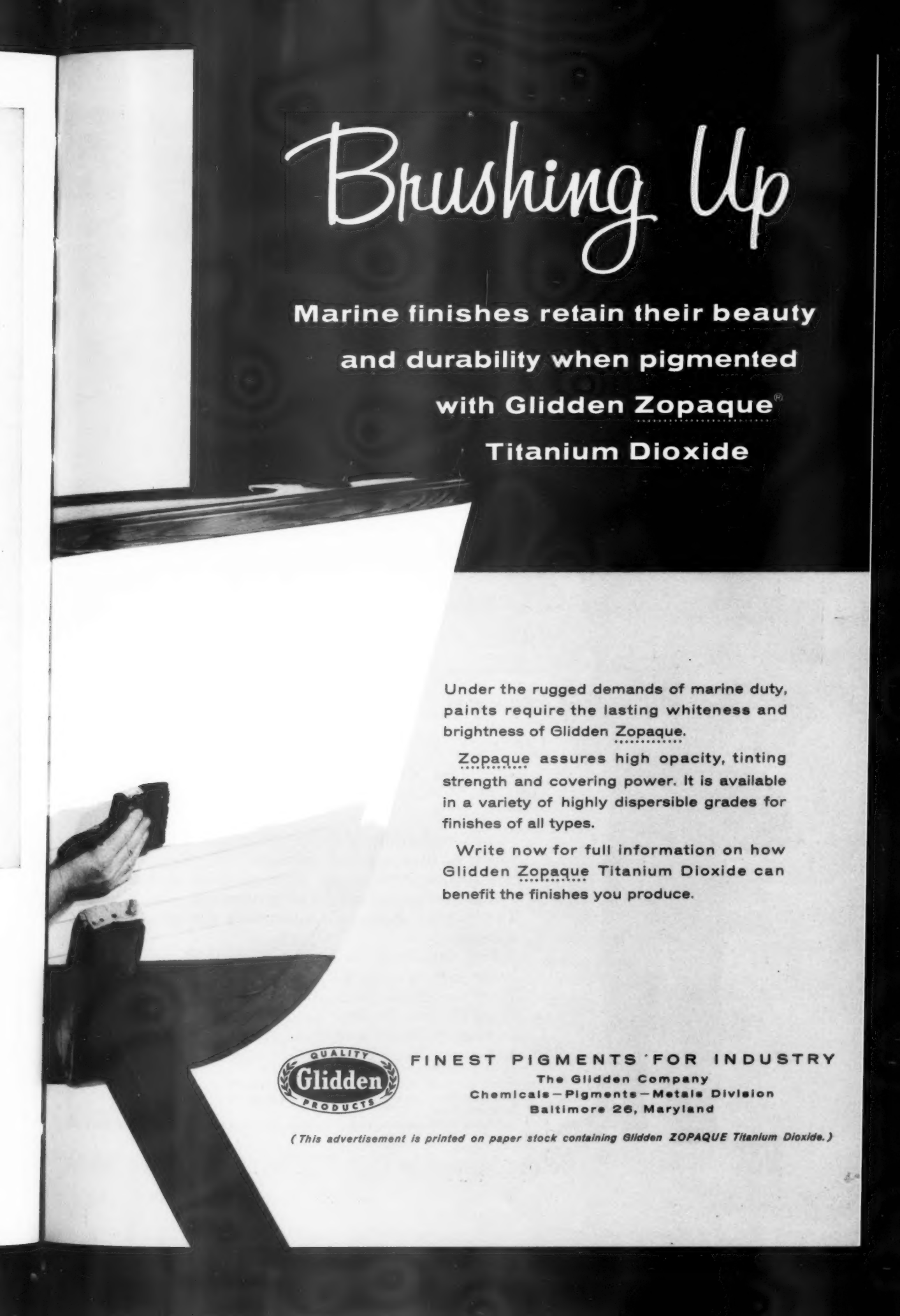
These time-proved additives impart the anti-sag and flow control, pigment suspension, smooth brushability, controlled penetration, stability and freedom of formulation that insure optimum paint performance. Ask your Baker man today for the full story on THIXCIN R and M-P-A and, most important, their use in *your* formulation. Baker plants at Bayonne and Los Angeles, offices and warehouses in principal cities.

7580

the **Baker** castor oil company

ESTABLISHED 1857

BAYONNE, NEW JERSEY



Brushing Up

Marine finishes retain their beauty and durability when pigmented with Glidden Zopaque® Titanium Dioxide

Under the rugged demands of marine duty, paints require the lasting whiteness and brightness of Glidden Zopaque.

Zopaque assures high opacity, tinting strength and covering power. It is available in a variety of highly dispersible grades for finishes of all types.

Write now for full information on how Glidden Zopaque Titanium Dioxide can benefit the finishes you produce.

QUALITY Glidden PRODUCTS

FINEST PIGMENTS FOR INDUSTRY

The Glidden Company
Chemicals—Pigments—Metals Division
Baltimore 26, Maryland

(This advertisement is printed on paper stock containing Glidden ZOPAQUE Titanium Dioxide.)

DEWEY & ALMY FORMULA

70 pounds of Celite 281 are contained in every 100 gallons of Dewey & Almy's vinyl acetate copolymer exterior paint formulation 84600. For full details, write for formulation 84600 to Dewey & Almy Chemical Company, Division of W. R. Grace & Co., Cambridge 40, Massachusetts.

On masonry surfaces, I have to be sure the paint won't chalk or blister.

He can be sure with Dewey & Almy's Formula 84600 using Celite diatomite

The micro-porosity of Celite* helps to increase moisture-vapor permeability and prevents blistering and peeling. The unique structure of Celite particles provides extra weather-resistance and helps prevent excessive chalking. The irregular shapes of the particles also promote better adhesion.

Find out how Celite can help prevent blistering and enhance film integrity in exterior paint. Write for further information to Johns-Manville, Box 14, New York 16, N.Y. In Canada, Port Credit, Ontario.

After nearly four years of severe exposure conditions on this building, Dewey & Almy's vinyl acetate copolymer paint containing Celite shows outstanding film integrity . . . is chalk-free, mold-free, remarkably fresh and clean.

*Celite is Johns-Manville's registered trade mark for its diatomaceous silica products

JM PRODUCTS

Johns-Manville CELITE Diatomite Pigments

COATINGS FROM CYCLOHEXENE OXIDE DERIVATIVES

By
C. W. McGary, Jr.
C. T. Patrick, Jr.
R. Stickle, Jr.

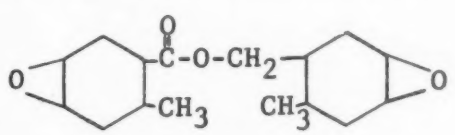
ABSTRACT

Drying oil varnishes were prepared from unsaturated fatty acids and diepoxides such as EP-201 (3,4-epoxy-6-methylcyclohexylmethyl 3,4 - epoxy - 6 - methylcyclohexane -carboxylate) using a novel sequence of reactions. The diepoxide and fatty acid were mixed in such proportions that, after reaction at relatively mild temperatures, residual epoxide groups were maintained. In the presence of an initiator such as boron trifluoride, the residual epoxide and generated hydroxyl groups condensed to give a soluble polymeric composition which was very useful in surface coating applications.

Films from these compositions cured rapidly at room temperature and at bake temperatures. The fully cured films had excellent color retention when exposed to ultraviolet light and they also had excellent hardness, flexibility and resistance to caustic and water.

THE preparation of synthetic drying oil compositions in the coatings industry has generally involved the high temperature esterification of polymeric polyhydric alcohols with long chain, unsaturated fatty acids. Polyesters derived from phthalic anhydride and glycerol have achieved widespread utility in such applications. However, in many cases, surface coatings having good solvent and alkali resistance are required. Polyethers derived from epichlorohydrin and 2,2′-bis-(para-hydroxyphenyl) propane have gained popularity in primers; however, the color retention and chalking characteristics have limited more general acceptance. Accordingly, an investigation of new systems was undertaken in anticipation that both disadvantages could be overcome.

It was found that diepoxides such as EP-201* (I) could be advantageously utilized in the synthesis of varnishes by using a novel reaction sequence. The



I

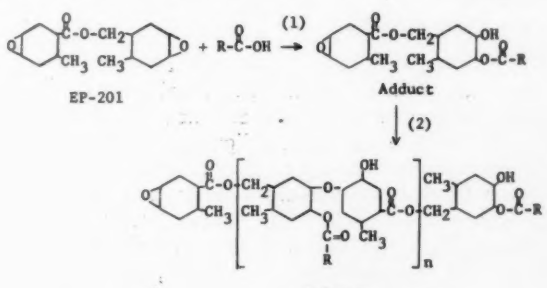
diepoxide was first esterified with fatty acids in such proportions that residual epoxide groups remained. These adducts were then polymerized in solution with the aid of certain catalysts to give excellent varnishes.

The authors of this paper are associated with the Research Department, Union Carbide Chemicals Company, South Charleston, West Virginia.

*3,4 - Epoxy - 6 - methylcyclohexylmethyl 3,4 - epoxy - 6 - methyl - cyclohexa - necarboxylate.

Discussion

The preparation of varnish solutions described in this report constitutes two reactions. The first of these is the reaction of the diepoxide with fatty acid in such proportions that residual epoxide groups are left. The second step involves the polymerization through these epoxide groups to obtain polymeric products having film-forming characteristics. This unique sequence is illustrated by equations (1) and (2).



It is believed that the polymerization occurred through the reaction of epoxide and hydroxyl groups. Isomeric, branched polymer structures can be drawn but the principles remain the same. In order that the polymerization reaction proceed at a suitable rate, it was desirable to have a catalyst present. The carboxyl groups present during the adduct preparation catalyzed some condensation but to obtain completely polymerized products, stronger catalysts such as boron trifluoride or stannic chloride were added in the second step. The preparation and polymerization of the diepoxide-fatty acid adducts and the characteristics of the cured films are described in subsequent sections.

Preparation of Adduct.

The reaction of EP-201 and fatty acids such as dehydrated castor oil acid proceeded rapidly at temperatures in the range of 160° to 200°C. The acid number as a function of reaction time and temperature is given in figure 1 for a system containing an initial carboxyl-epoxide ratio of 0.45. Compositions containing a greater proportion of carboxyl groups required slightly longer esterification periods.

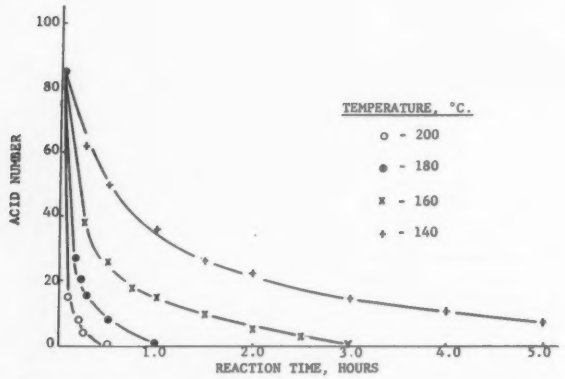


Figure 1. Effect of temperature on the rate of esterification of EP-201 with dehydrated castor oil acid. The ratio of carboxyl to epoxide group was 0.45.

The ratio of the fatty acid to epoxide was significant in determining the residual epoxide content in the adducts. Figure 2 illustrates that larger proportions of fatty acid resulted in lower concentrations of epoxide. Furthermore it is observed that more epoxide was consumed than can be attributed to esterification. This fact is interpreted by assuming that appreciable polymerization (epoxide-hydroxyl condensation) occurred during the adduct preparation. It will be seen in a later section that the proportions of monomers used greatly affect the molecular weights of the polymerized product.

The temperature at which the adducts were prepared had little effect on the residual epoxide content, although higher temperatures tended to give slightly higher oxirane contents. Figure 3 shows the effect of reaction temperature on the viscosity of the adducts taken to an acid number of about one. Presumably polymerization through the double bonds or through epoxide-hydroxyl reaction was responsible for the increased viscosities of the adducts prepared at lower temperatures and longer reaction periods.

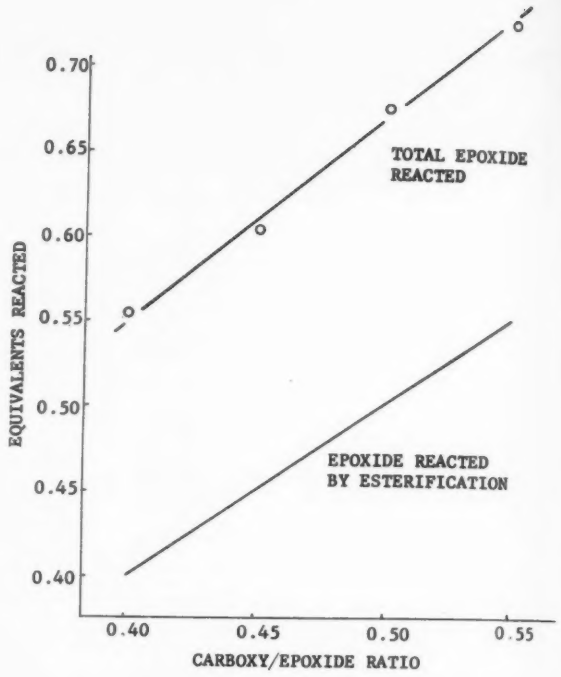


Figure 2. Residual epoxide content as a function of the reaction ratio of EP-201 and dehydrated castor oil acid. The adducts were prepared at 160 deg. C. by reacting to an acid number of one or less.

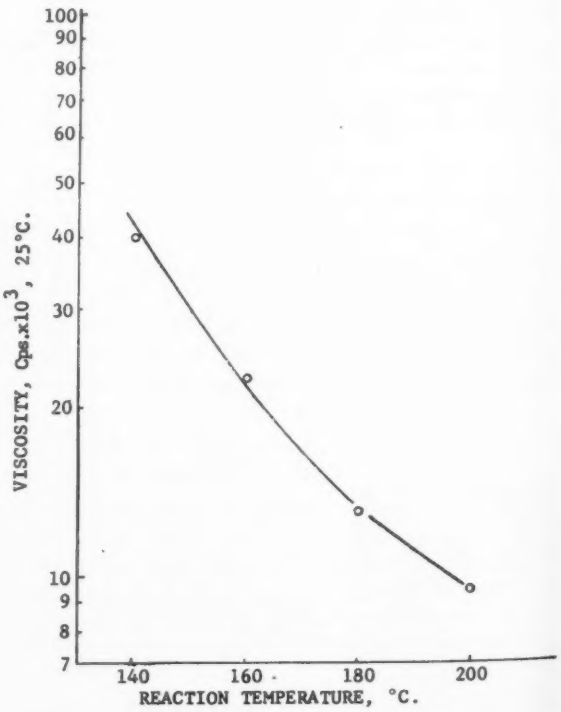


Figure 3. The effect of esterification temperature on 0.45 adduct viscosity. Reactions were stopped at an acid number of one or less.

Polymerization of Adduct

The polymerization of the diepoxide-fatty acid adducts (reaction 2) was greatly accelerated in the presence of certain acidic compounds such as boron trifluoride and stannic chloride. Boron trifluoride etherate initiated the reaction very effectively at temperatures in the range of 20° to 40°C. The reaction was exothermic and essentially complete within one hour after the addition of catalyst, even at dilutions of up to 50 per cent with solvent. Stannic chloride was also very effective but required temperatures in the range of 80° to 110°C. for rapid polymerization. The presence of the tin residue in the polymer also appeared to inhibit the room-temperature film cure and to promote the film cure at elevated temperatures. Figure 4 illustrates the effect of boron trifluoride concentration on the viscosity of the polymer solution. Basic initiators such as amines and sodium hydroxide were relatively ineffective in promoting the condensation of adducts derived from EP-201.

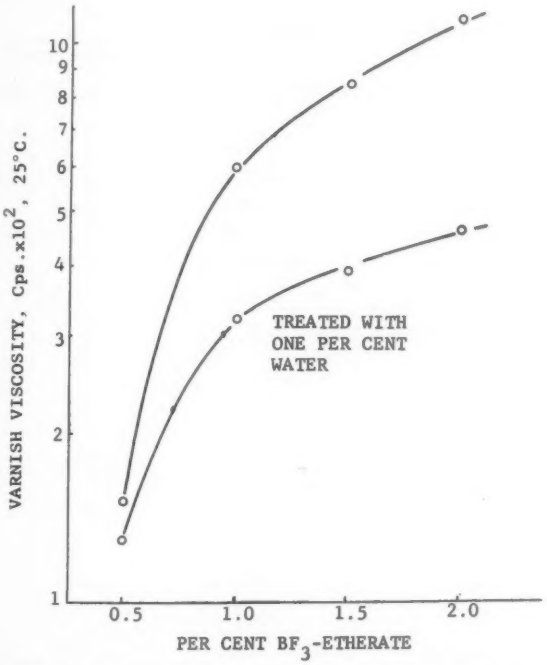


Figure 4. Polymer viscosity as a function of boron trifluoride-etherate catalyst concentration. Polymer was based on a 0.475 adduct which was prepared at 180 deg. C. Viscosities were obtained at 50 percent non-volatiles.

The proportion of fatty acid and diepoxide charged in the adduct preparation was very significant in determining the molecular weight of the polymer. The optimum formulation was derived from a carboxyl-epoxide ratio ranging between 0.40 to 0.55 as illustrated in figure 5. Lower proportions of fatty acid tended to give gelled products whereas higher proportions led to polymers which had unnecessarily low molecular weights. From the viewpoint of handling characteristics and film properties, the preferred compositions were between 0.45 and 0.55 carboxyl groups for each epoxide group in the original adduct charge.

In general, the temperature at which the adduct was prepared had very little effect on the solution vis-

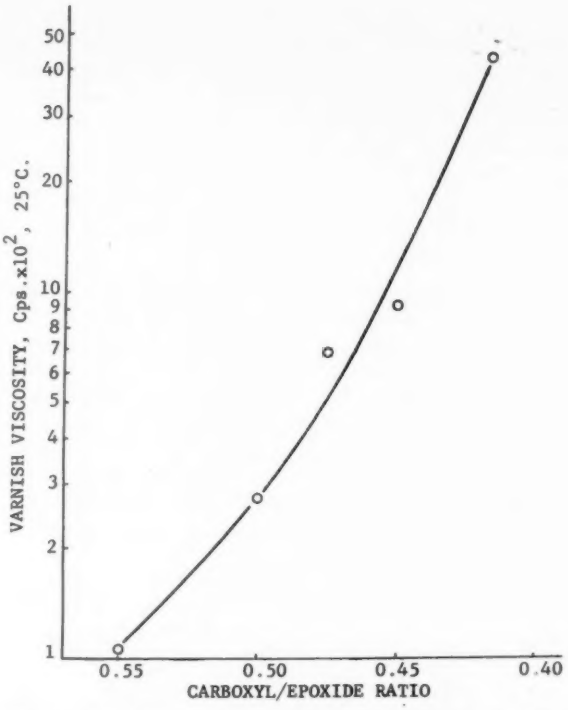


Figure 5. Effect of the carboxyl-epoxide ratio on the corresponding polymer viscosities. The polymers were based on adducts prepared at 200 deg. C. and polymerized with 1.25 percent boron trifluoride-etherate catalyst. Viscosities were determined at 50 percent non-volatiles.

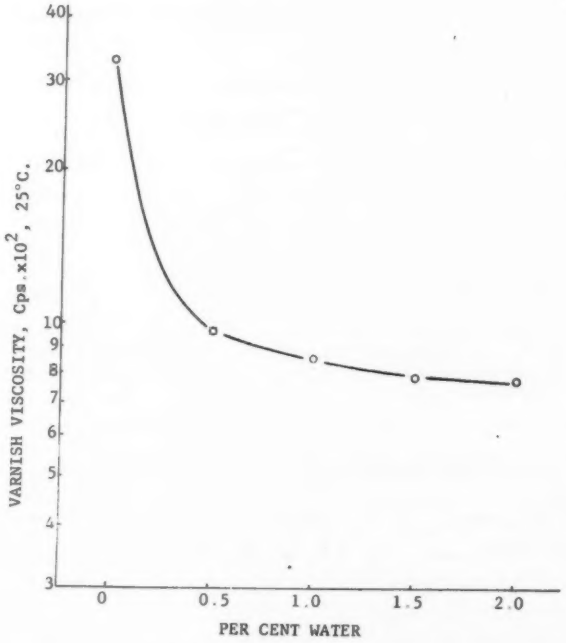


Figure 6. The effect of water on polymer viscosities. The water was added to the final product which was then stirred at 50-60 deg. C. for 30 min. The varnish was based on a 0.475 adduct polymerized with 1.5 percent boron trifluoride-etherate.

cosities of the product. It was observed in a previous section, however, that the adduct viscosity was affected by this preparative temperature presumably because of either polymerization through the double bonds or epoxide-hydroxyl reaction. It was also observed that polymers derived from a carboxyl-epoxide ratio of less than 0.45 were influenced in a similar manner. Apparently as the ratio approaches that leading to a gel, the bodying then becomes a significant factor.

It was found that the addition of a small quantity of water to the product decreased the solution viscosity significantly. In cases where semi-gelled polymers formed, the incorporation of one per cent of water based upon the solids, converted the gel to a mobile solution. Data showing this effect are given in figures 4 and 6. One explanation for this phenomenon is based on the postulate that the inorganic initiator entered into the polymer chain by forming inorganic ether linkages[1]; for example, if boron trifluoride were used, the borate should have been easily hydrolyzed. Furthermore, in the case of stannic chloride initiation, the polymer viscosities were also greatly reduced by heating the mixture for a short period at 140° to 160°C. The thermal breakdown of tin-oxygen-carbon bonds in this temperature range has been observed previously[2]. The addition of water to the polymer mixtures could also reduce the viscosity by reducing interpolymer hydrogen bonding.

The polymerization reaction was carried out in enough solvent to give a polymer concentration of about 50 to 55 per cent. Xylene was generally used since the solubility characteristics were excellent. The varnishes also had a high tolerance for aliphatic solvents.

Film Properties

Film properties were determined using conventional dip-coating and testing methods. In order to

Table I. Effect of fatty acid content on varnish properties.

Adduct Ratio (1)	DCO Acid % (2)	Solids % (3)	Varnish Properties: Flexibility, in. lbs.	Caustic Resistance	Water Resistance	Hardness, Sward
0.425	44.0	40.7	88	Excellent	Fair	89
0.450	45.5	41.0	108	Good	Good	86
0.475	46.9	43.0	108	Excellent	Good	84
0.500	48.2	47.0	108	Good	Good	85
0.550	50.5	50.0	108	Fair	Excellent	85
0.600	52.6	53.4	100	Poor	Fair	81

1. Ratio of carboxyl groups per epoxide group.
2. Dehydrated castor oil acid.
3. Solids required to give a dry film thickness of from 0.7 to 0.8 mil.

Table II. EP-201 varnishes from various fatty acids.

Fatty Acid	% Acid on Solids	Flexibility by Impact, in. lbs.	Chemical Resistance: Water	Caustic	Hardness, Sward
DCO (1)	45	>108	Exc.	Exc.	87
Linseed	45	80	Exc.	Good	90
Soybean	45	100	Exc.	Good	90
Soybean (2)	45	88	Exc.	Exc.	85
Tung (3)	53	>108	Exc.	Exc.	66

1. Dehydrated castor oil.
2. Varnish contained 10 percent of butylated melamine resin from American Cyanamid Co. designated as "Cymel Resin 448-8".
3. Varnish prepared from 0.55 adduct and final viscosity was 1070 cps. at 50 percent solids. Care was necessary to avoid premature gelation.

Table III. Comparison of EP-201 and conventional varnishes.

Varnish Composition: Polymer Base	Fatty Acid Content (1), % on Solids	Film Properties: Flexibility by Impact, in. lbs.	Chemical Resistance: Water	Caustic	Hardness, Sward	U.V. Resist.
Conventional epoxide (2)	40	>108	Exc.	Exc.	69	Poor
Alkyd (3)	40	>108	Exc.	Poor	73	Good
EP-201	45	>108	Good	Exc.	87	Good

1. Dehydrated castor oil acid.
2. Epoxide equivalent weight of about 1,000.
3. From American Cyanamid Co., designated "Rezyl Resin 330-5".

obtain optimum film properties by air drying or baking at 160°C. driers such as cobalt and lead naphthenate were used. Table I shows that varnishes from 0.425 to 0.5 adducts had better caustic resistance than those from the higher adducts while the varnish from the 0.55 adduct gave the best water resistance. Only slight differences in caustic resistance were detected where ratings of excellent and good were used.

Table II illustrates the properties obtained for cured films derived from EP-201 and various fatty acids. It was observed that the addition of small proportions of a butylated melamine resin was useful when using more highly saturated fatty acids which generally lead to better color retention.

Table III gives a comparison of the baked film properties of EP-201 varnishes and two commercial products based on a conventional epoxide and a phthalic-type alkyd.

The excellent caustic resistance of EP-201 films was not altogether unexpected since the ester group in EP-201 is well protected from chemical attack, presumably by the 6-methyl substituents. It has been observed in this laboratory[3] that the diene from which EP-201 may be derived saponified less readily than dioctyl phthalate by a factor of 31.

Experimental

Materials

EP-201 had an epoxide equivalent weight of 155 and a viscosity of 1300 centipoises at 25°C.; it was a product of Union Carbide Chemicals Company. Dehydrated castor oil acid was obtained from the Baker Castor Oil Company and was designated as Baker Acid 9-11. Acids from linseed oil, soybean oil and tall oil were "water white" grades from the Archer-Daniel-Midland Company. Other materials were the best commercial grades available.

Preparation of Typical Varnish

To a round-bottomed flask fitted with a stirrer, a nitrogen-purge line, a condenser and a thermometer, there was added 160 g. (1.03 epoxide equivalents) of EP-201 and 140 g. (0.49 equivalents) of dehydrated castor oil acid. The mixture was stirred and heated rapidly to 180°C. After 1.25 hours at this temperature the adduct was cooled to room temperature and had an acid number of 0.4 and a viscosity of 20,300 centipoises at 25°C.

The polymerization step was performed by adding 23 g. of xylene to 209 g. of the adduct and by subsequently adding a catalyst solution of 2.6 g. of boron trifluoride etherate and 149 g. of xylene. The latter addition required 12 minutes during which time a temperature of 20 to 30°C. was maintained by cooling externally with water. After the catalyst was fed an additional 38 grams of xylene was added and the mixture was stirred for one hour to assure complete reaction. The polymer solution was dark amber (Gardner-Holdt of 12-14) and very viscous (3,620 centipoises). Upon the addition of 1.97 g. of water, the stirred mixture became light amber (Gardner-Holdt of 4-6) and the varnish viscosity at 50 per cent non-volatiles was lowered from 3,620 to 685 centipoises at 25°C. Epoxide analysis, prior to the addition of water, indicated that essentially all of the epoxide was consumed during the reaction.

Preparation and Evaluation of Films

Standard dip-coating techniques were used in preparing 0.7 to 0.9 mil coatings on bonderized steel panels. The varnishes contained 0.01 and 0.5 per cent, based on the solids, of cobalt and lead driers respectively, for baked and air dried finishes. The films were dried at room temperature for 15 minutes and then baked at 350°F. for 30 minutes.

To determine film flexibility, the panels were subjected to a bump test with a du Pont-Parlin impact tester and the results are reported in inch pounds passed. Sward hardness was determined on 0.8 to 1.2 mil, clear films baked on glass plates.

The caustic resistance was checked by immersing the panels in a 20 per cent sodium hydroxide solution for 24 hours at room temperature. Ratings were made as excellent for very slight softening and a trace of blushing, good for slight softening and blushing, fair for moderate softening and blushing and for loss of gloss, and poor for dissolved films. Films immersed in boiling water for one hour were rated as excellent for no effect, good for slight softening and loss of gloss, fair for moderate softening and loss of gloss and for some loss of adhesion.

Ultraviolet light resistance.—The varnishes to be tested were pigmented with titanium dioxide using a resin/pigment ratio of 3/2. After the addition of driers, black iron panels were dip-coated to give a dry film thickness of about 1.5 mils. After air drying for seven days, the panels were exposed to ultraviolet light for two weeks. This exposure was done in a closed cabinet which was maintained at 60°C. with electrically heated, mechanically converted air. The panels were placed three inches from two 40 watt, Westinghouse, fluorescent type sun lamps. The commercial epoxy based varnish turned yellow after four days of exposure and after two weeks, had severely yellowed and severely chalked. All other varnishes, shown in Tables I, II and III, had chalked slightly after the full exposure.

Summary

Drying oil varnishes were prepared from unsaturated fatty acids and diepoxides such as EP-201 (3,4-epoxy-6-methylcyclohexylmethyl 3,4-epoxy-6-methylcyclohexane-carboxylate) using a novel sequence of reactions. The diepoxide and fatty acid were mixed in such proportions that, after reaction at relatively mild temperatures, residual epoxide groups were maintained. In the presence of an initiator such as boron trifluoride, the residual epoxide and generated hydroxyl groups condensed to give a soluble polymeric composition which was very useful in surface coating applications.

Films from these compositions cured rapidly at room temperature and at bake temperatures. The fully cured films had excellent color retention when exposed to ultraviolet light and they also had excellent hardness, flexibility and resistance to caustic and water.

Bibliography

1. C. C. Price and M. Osgan; J. Am. Chem. Soc. *78*, 4787 (1956).
2. Mack, P. G. and Parker, E., U.S.P. 2,626,953 (1953).
3. Private communication with Mr. R. H. Peterson.

This paper was presented before the National Meeting of the American Chemical Society, Div. of Paint, Plastics, and Printing Ink Chemistry, Sept. 13-18, 1959, in Atlantic City, N. J.

New performance data on Isophthalic-based coatings!

As a part of its continuing Isophthalic research program, Oronite employed a well-known independent laboratory to test a series of alkyd formulations. In almost every instance the Isophthalic-based products outperformed the competing commercial alkyds. Comparative data was secured in five categories.

Air-Drying Coatings. The Isophthalic-based alkyds showed faster air-drying without compromising other properties. Through-dry, hardness, toughness, adhesion and resistance to impact also favored the isophthalic alkyds.

Furniture Lacquers. Improved hardness and sanding ease without sacrificing cold-checking resistance, as well as other desirable properties—such as better adhesion, gloss and color retention, resistance to abrasion proved the Isophthalic alkyds superior.

Industrial Baking Enamels. Good results were also recorded in baking enamels, indicating how Oronite Isophthalic can solve important application and exposure problems.

White Baking Enamels. Properties such as pigment suspension, initial whiteness, resistance to water, alcohol, detergents and salt spray were significantly improved in the Isophthalic-based enamels.

Machinery and Maintenance Coatings. These comparison tests showed that Isophthalic alkyds performed extremely well in four-hour-drying machinery and maintenance coatings. Results are available to you for evaluation.

Write for complete test results. Address your inquiry to the executive offices of Oronite.

ORONITE CHEMICAL COMPANY
A CALIFORNIA CHEMICAL COMPANY SUBSIDIARY
EXECUTIVE OFFICES • 200 Bush Street, San Francisco 20, California
SALES OFFICES • New York, Boston, Wilmington, Chicago, Cincinnati, Cleveland, Houston, Los Angeles, San Francisco, Seattle
Foreign Affiliate: California Chemical International, Inc., San Francisco, Geneva, Panama

6261

Southern Paint & Varnish Production Club To Hold Annual Meeting March 16-19 in Atlanta, Ga.

The Annual Convention of the Southern Paint & Varnish Production Club, will be held March 16-19, 1960 at the Atlanta Biltmore Hotel, Atlanta, Georgia. The four-day meeting will include:

Wednesday, March 16

Morning:

Erection of Booths, Installation of Machinery and Raw Materials Exhibits

Afternoon:

1:00 - Registration Desk and Raw Materials and Machinery Exhibits Open

5:00 - Raw Material and Machinery Exhibits Close

6:00 - Registration Desk Closes

Thursday, March 17

8:30 A.M. - Registration Desk and Raw Materials and Machinery Exhibits Open

Introduction of Federation Officers and Representatives

Introduction of National Paint, Varnish & Lacquer Association Representative

10:30-12 N. - Technical Papers

12:00 N. - Adjourn for Lunch

12:30 - Luncheon for Officers and Advisory Committee with Officers of the Federation of Societies for Paint Technology and Officers of the National Paint, Varnish & Lacquer Association

2:15-4 P.M. - Technical Papers

5:00 P.M. - Registration Desk and Raw Material and Machinery Exhibits Close

Friday, March 18

8:00 A.M. - Breakfast Meeting of the Federation Officers and the Nominating Committee, C. B. Thomas, Chairman

8:30 A.M. - Machinery and Raw Materials Exhibits Open

9:45 A.M. - Business Meeting, Southern Paint & Varnish Production Club Report of Council Representative, William A. Smith

Committee Reports:

Membership	P. S. Tully
Technical	Clarence H. Jocoy
Finance	E. M. Fairbrother
Educational	Ross McKenzie
By-Laws	W. E. Hood
Publicity	C. P. Schlesinger
Nominating	C. B. Thomas

Election of Officers for 1960-61

11:00-12 N. - Technical Papers

12:00 N. - Adjourn for Lunch

2:30-4 P.M. - Technical Papers

4:00 P.M. - Meeting Adjourned

5:00 P.M. - Machinery and Raw Materials Exhibit Closes

Friday Evening

7:30 P.M. - Banquet for Ladies and Gentlemen

9:00-1 A.M. - Informal Dance

Saturday, March 19

8:30 A.M. - Breakfast Meeting of the Advisory Committee and Federation Officers

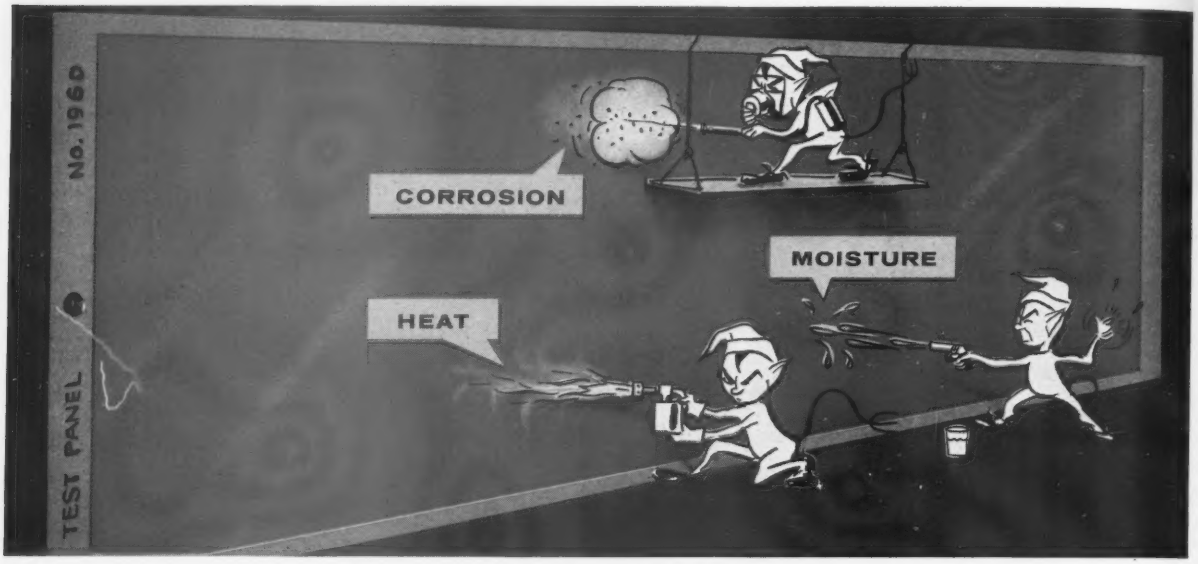
The technical papers will include material on acrylic esters by Howard D. Cogan, Union Carbide Chemical Co.; fungicides for paints by Joseph Ramp, Metalsalts Corp.; latex paints by Peyton Wheeler, Minerals & Chemical Corp. of America; emulsion paints by W. F. Scheufele, Dewey & Almy Chemical Div., W. R. Grace & Co.; polyvinyl acetate paints by Harold Jaffe, Colton Chemical Co.; and painting of exterior wood by John J. Hughes, Moderator.

LIST OF EXHIBITORS

BOOTH NO.	*EXHIBITORS*
14	Advance Solvents & Chemicals
46, 47	Archer-Daniels-Midland Company
30	The Baker Castor Oil Company
13	Charles L. Burks & Company
11	Colton Chemical Company
24	Commercial Solvents Corp.
4, 5, 6	Dewey and Almy Chemical Company
39, 40	The Dow Chemical Company
20, 21	General Aniline & Film Corp.
35, 36	The Goodyear Tire & Rubber Company
44	Herman Hockmeyer & Company
37	R. T. Hopkins Company
2	Interchemical Corporation
38	Kinetics Dispersion Corp.
51	Metalsalts Corp.
15, 16	Metals Disintegrating Company
34, 35	Minerals & Chemicals Corp. of America
25	Mineral Pigments Corporation
48, 49	Morehouse-Cowles Corp.
10	Naftone, Inc.
1	Nuodex Products Company
42, 43	A. J. Passonno Company
45	Pennsylvania Industrial Chemical Corp.
50	Raybo Chemical Company
31, 32	F. H. Ross & Company
26, 27	Shell Chemical Company
22, 23	Smith Can Company, Inc.
12	Spencer Kellogg and Sons, Inc.
41	Troy Chemical Company

SILICONE NEWS from Dow Corning

A New "Resistance" Movement



Silicone Resin Based Coatings Resist Paint's Worst Enemies!

The demand is great . . . the movement is on . . . for finishes that stand up longer, hold costs down, build greater user satisfaction. Heading the movement, and making it possible for you to add a new measure of *high performance* to your finishes, are silicone resins by Dow Corning. Which of these resins could improve the formulations you're working on right now?

804 Resin is a hard resin with excellent color and gloss retention and good heat stability at 400 F. Compatible with many organic resins, it is blended with them to improve resistance to both heat and water. Typical applications: coating impeller blades of jet aircraft; sealing electrical equipment; additive to basing cements for vacuum tubes.

805 Resin forms flexible film with good aluminum leafing properties and stability at 1000 F plus. Metallic paints made with 805 Resin are excellent for stacks, mufflers, boilers, jet engines, exhaust manifolds, heat exchangers, other high temperature equipment.

806A Resin is a hard, nonflexible material often blended with 805 Resin in aluminum formulations to increase toughness, improve drying properties. Makes colored enamels that have excellent hardness and adhesion at service temperatures to 450 F.

808 Resin is a flexible resin that combines outstanding heat resistance with excellent gloss retention. Used in colored baking enamels for service temperatures up to 550 F. Decorative finishes based on 808 Resin have excellent adhesion, color and gloss retention and corrosion resistance. Ideal for space heaters, clothes driers, stoves and other hot appliances.

840 Resin is compatible with many organic resins. Readily blends with them to improve heat stability and weather resistance. Color and gloss retention of high temperature decorative finishes is vastly improved by blending in 840 Resin; coatings stay good looking in continuous service up to 400 F.

Silicone Intermediates, Too!

Z-6018 is a low molecular weight silicone intermediate which will react with a wide variety of organic protective coating resins and monomers to improve heat stability, moisture resistance and weatherability. Reacts readily with alkyds, phenolics, epoxies, cellulosics, polyesters and other organic resinous materials containing hydroxyl groups.

Sylkyd 50 is a silicone intermediate which will react with organic protective coating resins to provide a flexible coating and improve their moisture resistance, heat stability and weatherability. Polymerizes with alkyds, phenolics, epoxies and other resins having free hydroxyl groups.

Help *your* formulations resist those demons that fight paints. Write today for complete data on Dow Corning silicone resins or intermediates. Address Dept. 4103.

Your nearest Dow Corning office is the number one source for information and technical service on silicones.

first in silicones

Dow Corning CORPORATION
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.

By
Phil Heiberger

The author continues his random reflections on various aspects of the paint industry. The opinions expressed in this column are his alone and do not necessarily reflect those of this publication.

Dividends from Isolation

IT has been suggested from time to time that the isolation of specific fractions of resinous materials could be extremely advantageous. For example, certain fractions of an alkyd or varnish might prove to be unusually valuable, and the elimination of high and low fractions might very well upgrade a given resin beyond all reasonable expectations.

P. Heiberger

Such conjecture may seem farfetched to profit-minded readers, but the following quotation from *Chemical Week* (January 9, 1960 "Setting New Standards for Biochemicals") indicates otherwise.

"Upgrading ordinary chemicals can also yield dividends. Crude linoleic acid, worth $2.10 per pound in paint grades, sells for about $1,000 per pound when highly purified in the form required for cholesterol metabolism research. To get this purity requires saponification of safflower oil, two crystallization steps, esterification, fractional distillation, and further saponification. This pure form must be shipped in vacuum sealed containers stored below 5° C."

One need not go to such extremes, but the possibility that a crude separation may produce dividends cannot go unheeded much longer.

Animal vs. Vegetable

Products' origins profoundly affect their characteristics, even though generic terms tend to deemphasize dramatic differences. Although classified similarly and given the same general name, products derived from the animal kingdom are never identical to their counterparts from the vegetable kingdom. Two categories of products, fats and resins, will illustrate this observation.

Fats

Animal fats are characterized by the presence of saturated acids. Vegetable fats, on the contrary, are frequently associated with unsaturated fatty acids. Observers have noted that unsaturated fats fed to ruminants (hoofed mammals with quadripartite or tripartite stomachs, such as sheep, goats, and oxen) are converted into saturated fats by some hydrogenation mechanism. Oils or fatty acids containing linolenic acid, for example, were found to be converted mainly into stearic acid.

It had been assumed, until recently, that the conversion was a function of the ruminant itself, but D. E. Wright, in "Hydrogenation of Lipids by Rumen Protozoa" (Nature *184*, 875 (1959)), has now reported that the responsibility for this hydrogenation is not a metabolism conversion but one that can be traced directly to the protozoa found in the rumen (first stomach). Examination of the rumen contents was made possible by an opening into the stomach through the abdominal wall.

It appears that these large members of the animal kingdom play host to their one-celled colleagues in return for special services. At any rate, it is a clear demonstration of a fine partnership between two kinds of animals dedicated to the establishment and maintenance in their products of an identity plainly distinct from products derived from the vegetable kingdom.

Resins

The only resin used by the coating industry that can boast animal origin is shellac. An interesting chemical feature of shellac is that it is composed of hydroxy fatty acid interesters which are totally absent from other natural resins known to the paint manufacturer. The essential constituents of the resins of vegetable origin consist of oxidized polyterpenic acids, aromatic acids, phenolic compounds, resenes, or essential oils.

Paper Chromatography

H. P. Kaufman and his associates have devoted a series of articles to the adaptation of paper chromatographic techniques for analysis of a group of oils and oil derivatives. Since many of these procedures may have value to paint scientists, they are noted briefly below. The articles were published in *Fette-Seifen-Anstrichmittel*.

A method for analyzing soya oil glycerides, for which paraffin oil or

silicone oil can be used as the stationary phase and acetone-acetonitrile mixtures as the mobile phase, is described in Volume 61, pages 523-8 (1959). The glyceride spots were detected after a KOH saponification and analysis of resulting fatty acids.

In the same issue, pages 561-5, appears a description of an investigation, with the help of infrared spectroscopy, of products arising from the autoxidation of linseed oil. Olive oil adulteration is discussed in a later issue, on pages 768-79. Methods of detecting fatty aldehydes can be found on pages 750-9, and the use of paraffin impregnated paper to identify nonionizable emulsifiers is detailed on pages 782-4.

One doesn't have to be an expert to note how extensively paper chromatographic techniques are mentioned in analytical literature and how thoroughly they are used throughout the chemical arts. The value of paper chromatography has certainly not been overlooked by the paint industry, but the paucity of discussions of chromatographic techniques appearing in paint publications leads to conjecture.

It may be that while many paint chemists "looked" at paper chromatographic methods, few persevered long enough to overcome initial failures or resumed attempts to succeed after having been diverted to other work. If difficulties arose, they may have been caused by faulty attitudes, for in this area of microchemistry patience, attention to detail, and painstaking efforts are vitally important.

Paints and Viewpoints

There is no question about it. Additives are the darlings of paint people. Every paint defect or deficiency stimulates a frantic search for the additive with the magic touch that will give every paint story a happily-ever-after ending.

Just as every optimistic and imaginative maiden dreams of her conquering hero, the fairy prince, who can be depended upon at all times to rescue her from any distressing predicament in which she may happen to find herself, and every aging beauty dreams of the perfect cosmetic that will instantly hide telltale lines and wrinkles, so the paint formulator dreams of additives that can always be counted upon to avert disaster.

Admirable Additives

The truth is that additives are a marvelous convenience and often fulfill desperate needs and wishes. For this we will always be grateful. Nevertheless, we hope to be pardoned for admitting, somewhat reluctantly, that in occasional philosophic moods we have permitted these same additives to evoke more dour, less appreciative thoughts.

The gist of them is this: Despite their good qualities, additives, at best, merely alleviate symptoms while they cure no basic ailments, at worst, they provide stopgap measures that not only fail to solve basic problems, but encourage procrastination of intensive study and research in areas that must eventually be probed if paint science is to continue to progress in healthy fashion.

Too-easy, "pat" solutions stifle incentives for deep understanding of basic and difficult problems. Such understanding is vital not only to advancement, but as a guide for appropriate and intelligent action at those crucial moments when additives refuse to cooperate in their usual obliging way.

Adhesion ahd Subtractives

In the event of faulty adhesion, we seek to use a standard surface treatment, a primer, or an adhesion-producing component. More often than not, success crowns our efforts. However, with adhesion, as well as conventional paint problems, there come some trying moments when one is moved to utter a fervent wish for "subtractives."

In the case of adhesion problems, a subtractive process is feasible. After all, when dirty metals are cleaned by solvent degreasing, acid pickling, etc., the cause of the faulty adhesion is removed.

Boundary Layer

In recent years, Dr. Jacob J. Bikerman, Research Associate in the Department of Civil and Sanitary Engineering at Massachusetts Institute of Technology, theorized that the reason one material fails to adhere to another is that impurities and low-weight molecules cause a thin boundary layer between the two. This thin film is weak; any stress causes the film to break or tear.

Dr. Bikerman demonstrated the validity of his argument, according to a report in *Chemical and Engineering News*, Dec. 28, 1959, by removing impurities (by fractional crystallization) from polyethylene and using it as an adhesive between metals, glass, and other plastics. Dr. Bikerman has obtained peeling tensions up to about 90 oz. per in. for an aluminum-polyethylene-glass joint, compared with near zero for untreated polyethylene.

•

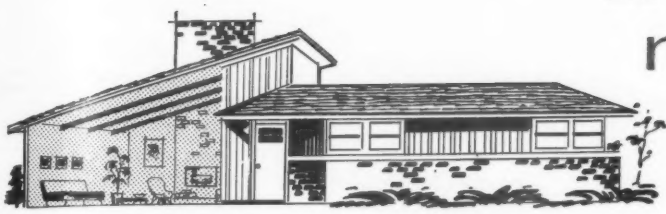
N. Y. Paint Society Hears A. Eickhoff on Metal Primers

The New York Society for Paint Technology held its last meeting on Thursday, February 7th, at the Brass Rail Restaurant, New York.

The main speaker of the evening was Arnold J. Eickhoff of the National Lead Co., who discussed *Variables Affecting Performance of Water Reduced Metal Primers.*

Arnold J. Eickhoff is a graduate of the University of Arizona and received his M. S. degree in Chemistry at the George Washington University in 1932. Mr. Eickhoff's 30 year career in the paint industry covers association with the National Bureau of Standards, the United States Maritime Commission and the National Lead Co. Research Labs where he has been concerned with customer service work and developing uses for pigments and gelling agents since 1943. He has presented many papers on various phases of the paint industry and his scientific membership includes The American Chemical Society, Sea Horse Institute, Research Committee of the Steel Structures Paint Council of the Mellon Institute, Gallows Birds Society, American Society of Testing Materials and Phi Lambda Upsilon.

His talk, which was prompted by the great increase in the use of water reduced industrial metal primers, because of the absence of fire hazard etc., included a study of the following variations: vehicle composition, thickening agents, driers and their incorporation, baking schedules, and pigmentation, including rust inhibiting types. Mr. Eickhoff's associates in these studies were J. Condry, L. Sander and H. Stanley.



a new concept in DRIERS

MELETEX

INCREASED SCRUB RESISTANCE OF DRIED FINISHES · INCREASED HARDNESS IMPROVED RESISTANCE TO WATER SPOTTING · IMPROVED RESISTANCE TO MINERAL SPIRITS · IMPROVED GLOSS AND COLOR RETENTION OF BAKED FINISHES · IMPROVED TRANSPARENCY OF CLEAR FILMS · FREEDOM FROM PINHOLING AND PITTING

WATER DISPERSED DRIERS FOR WATER DISPERSED PAINTS

Harshaw **MELETEX** Driers* represent an entirely new and novel concept in the drying of water thinned paint films.

Harshaw **MELETEX** Driers are the first PRE-DISPERSED Driers ready for immediate use—FREE OF VOLATILE SOLVENT—on the market. Completely compatible with all commercially available latexes, these driers offer distinct advantages over those previously used in the water paint field. Consisting of extremely fine dispersions of naphthenates in special aqueous media, these driers impart many desirable properties to water thinned paint films.

Write for Meletex folder furnishing complete information.

*Patent Pending

HARSHAW

THE HARSHAW CHEMICAL CO.

1945 E. 97th Street, Cleveland 6, Ohio

CHICAGO • CINCINNATI • CLEVELAND • DETROIT • HASTINGS-ON-HUDSON, N. Y.
HOUSTON • LOS ANGELES • PHILADELPHIA • PITTSBURGH

The LEHMANN VORTI-SIV

...a screening machine that has surprised the PAINT INDUSTRY

This amazing gyratory screening and sieving machine has features that astonish all who see it demonstrated. Its gyratory action is adjustable both in speed and radius of gyration to suit the material being processed. This makes it capable of throughputs greatly in excess of those possible with other machines used for the same purposes.

The Vorti-Siv processes powders, liquids and slurries in meshes from 4 to 400. The screen is practically non-blinding and mesh sizes can be changed quickly and easily. Cleanup takes only a few minutes. The unit occupies only four square feet of floor space and has casters that make it easily movable from one location to another. Definitely, the Vorti-Siv can reduce your screening and sieving costs.

SPECIFICATIONS

STANDARD HEIGHTS	OVER ALL	FUNNEL HEIGHTS FROM FLOOR
(with Totally Enclosed Motor)	43½″ 50½″	30¼″ 37¼″
(with Explosion Proof Motor)	46¼″ 50½″	33″ 37¼″

(2″ in Height can be gained in the above dimensions by reversing caster brackets.)
Special Heights above standard can be furnished at slight additional cost.

Write for full information and a free trial run of your product in our plant—or contact the Lehmann distributor nearest you.

LEHMANN®
world renowned in processing machinery

J. M. LEHMANN COMPANY, Inc.

MAIN OFFICE AND FACTORY: 550 NEW YORK AVE., LYNDHURST, N. J.

or

The R. P. Anderson Co.
2503 W. Mockingbird Lane
Dallas, Texas

Duncan Equipment Co.
506 Broadway
Seattle 22, Washington

Harry Holland & Son, Inc.
10600 Puritan Avenue
Detroit 38, Michigan

The Moore Drydock Co.
Ft. of Adeline Street
Oakland 23, California

Rawdon Myers Agency
Blue Ash Center Bldg.
Cincinnati 42, Ohio

E. C. Swift Co.
3537 Lee Road
Cleveland 20, Ohio

Harry A. Baumstark & Co.
6801 Hoffman Avenue
St. Louis 9, Missouri

Halsell Brokerage Co.
3101 Walnut Street
Denver 5, Colorado

The Hoshall Company
1414 Morningside Drive, N. E.
Atlanta, Georgia

Morton-Myers Co.
220 E. Missouri Avenue
Kansas City 6, Missouri

Wm. B. Sanford, Inc.
601 West 26th Street
New York, New York

Webster Equipment Co.
549 W. Randolph St.
Chicago, Illinois

Sada y Himes S.A., Apartado 911, Padre Mier 1250 Pte., Monterrey, N. L., Mexico

See our advertisement in Chemical Engineering Catalog

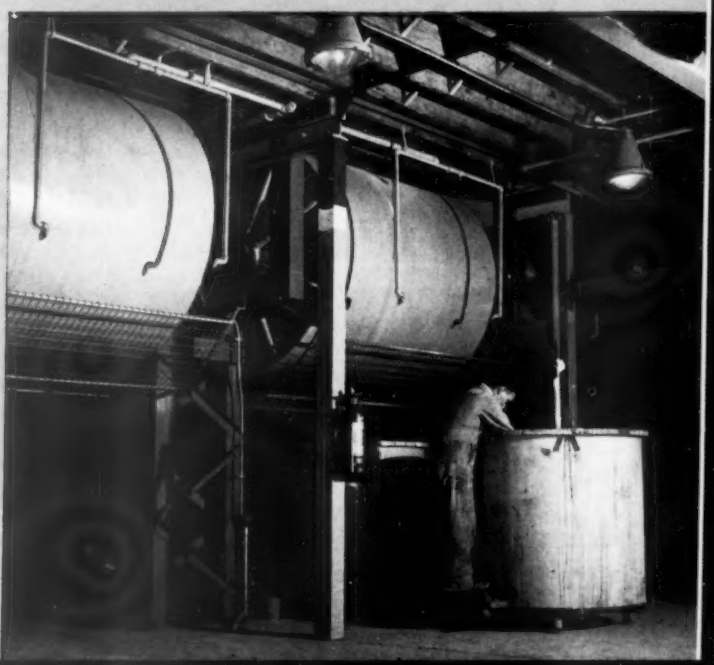
PRODUCTION

PACKAGING

MATERIAL HANDLING

NEW EQUIPMENT and MATERIALS

With this issue (page 53) PVP begins a two part series on ball mill operation for dispersing and grinding pigments. This month's installment deals with characteristics of ball mills and grinding balls, and a discussion of pigment particle size and consistency.

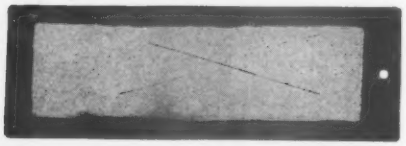


B-1030

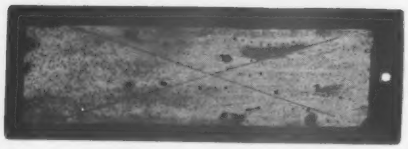
B-1030

a new and superior wash primer by Shawinigan

B-1030 is a new formulation for a two package wash primer based on BUTVAR, Shawinigan Resins' polyvinyl butyral resin. Developed especially to provide high early water resistance, B-1030 is also superior in adhesion to a variety of topcoats and substrates.



B-1030



WP-1.

B-1030 has demonstrated superior corrosion resistance. The steel panel shown at top was coated with B-1030, the other with WP-1. Each was exposed without topcoats to 5% salt fog for 500 hours. When the wash primer films were removed the panel protected by B-1030 showed much less pitting.

Other advantages of B-1030 are no hard pigment settling and lower cost per square foot when applied than WP-1. Write Shawinigan Resins Corporation, Dept. 2203 Springfield 1, Mass., for working formulations and technical data on BUTVAR and B-1030.

SALES OFFICES: ATLANTA CHICAGO LOS ANGELES
NEW YORK SAN FRANCISCO SPRINGFIELD

BUTVAR® *polyvinyl butyral resins by*

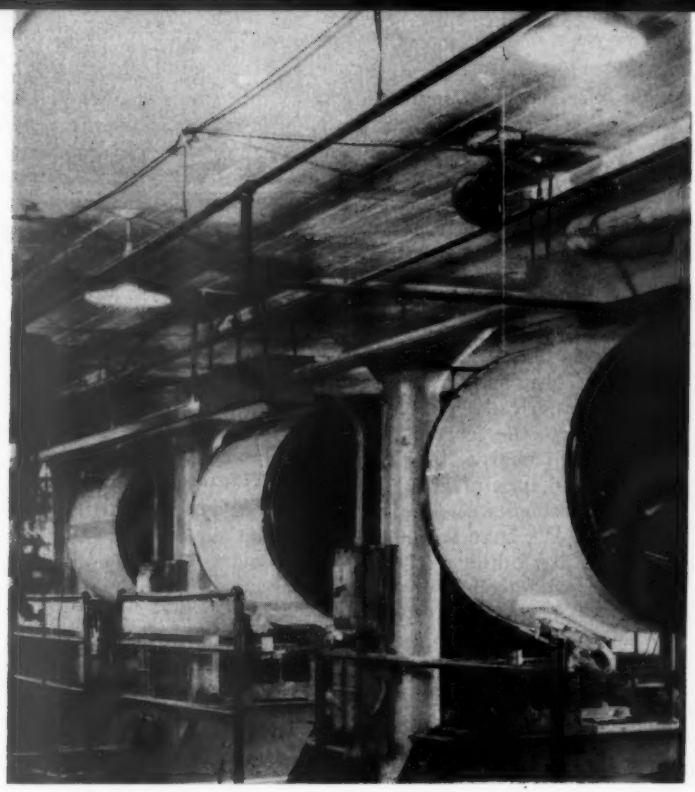
SHAWINIGAN RESINS

BALL MILL OPERATION

Part I

By

R. H. Jebens*



A careful study of the application of the ball mill for dispersion of pigments into paint, enamel, ink, and coatings indicates that the same general principles are followed as are used for the wet grinding of particles to small size. The slurries produced should be of high-pasty-consistency, with vehicles of low Newtonian viscosity. The mills should be operated at close to 65 percent of critical speed, without baffle bars, with 50 percent ball charge of the smallest uniform size practical as dictated by considerations of the density of the balls and slurry and the consistency of the slurry. The same results can be obtained in mills of any diameter if the factors given above are carefully controlled. The shortest time for grinding or dispersing is obtained with material to void ratio of one; however, this ratio may be increased to 2.5 without materially affecting the time required per unit volume of product produced.

Part I deals with characteristics of ball mills and grinding balls, and a discussion on pigment particle size and consistency as they apply to ball mill operation. Part II, scheduled for next month, will consider some of the variable factors in the use of ball mills for dispersing and grinding pigments to size and agglomeration.

THE ball mill has developed during the past twenty-five years from the use of pebbles to manufactured ceramics, larger ball charges, higher speeds, and larger paste volumes. Most important of all, the paste charge has changed from high viscosity vehicle and low solids to low viscosity vehicle and high solids.

Buhrstone mills with pebbles have been in use over 200 years for paint production. High gloss enamels made in France were for decades prepared in Buhrstone mills, and a few mills were used by our early settlers. Porcelain lined mills and porcelain balls were introduced around 1900 in this country. They were made from the same base stock as the insulator and china porcelain. Patterson introduced Porox in 1905; a hard porcelain that was brittle. A research program from 1927 to 1930 showed the need for changing the composition, and for the next three years the dry press and extruded products were compared until in 1933 the present Porox ball came on the market as a superior product for ball mill use.

The chosen formula must produce a body resistant to wear. It must be hard, but hardness in itself is no guarantee of wear resistance. The balls must also be tough; the grains must be bonded together. The bodies as developed must be proved in practice, and today the only good test of the quality the body of the Porox is a use test in the wear test mill.

The body is prepared in ball mills, which has improved in quality over the years because of greater care in maintaining the solids content of the "slop," use of uniform charge and raw materials, uniform ball size and charge grinding time, and mill speed. Whereas originally composition was considered the chief requirement for a good tough body, it is now known that all the above factors influence the quality of the product.

In 1945, Patterson marketed the Berylite ball and, as the name implies, beryl was used to obtain greater hardness. These balls were used for enamels, but their use was limited because of poorer wear resistance. There are still a few mills in use with these balls, which are now being converted to "Arlcite."

In 1947, Patterson placed on the market "Maturite"; the first of the high density balls. Zircon was the chief ingredient in this ball, but while the material is hard, it did not have the wear resistance of the Porox. This ball was 50% heavier than Porox, and did reduce the time to produce the finished product.

In 1953, Patterson placed on the market "Arlcite"; the second of the high density balls. Aluminum

*Mr. Jebens, formerly Application Research of the Patterson Foundry and Machine Co., is now engineer-economist with the Office of Saline Water, Dept. of the Interior, Washington, D. C.

oxide was the chief ingredient in this ball. It was not as heavy as the Maturite" but had very good wear resistance. This ceramic product has been widely accepted, and today over 80% of the ceramics we sell are of "Arlcite." When this ball was developed, the importance of particle size distribution as well as composition was considered so that a fine product has been obtained. The particle size is empirically controlled by maintaining the correct consistency, batch charge, ball size and charge, and time of grind, as well as the ingredients used in the composition. We have found the particle size distribution of the product can be best controlled by wet grinding.

The operator of the ball mill has assumed that the manufacturer has continuously evaluated the ball mill to provide the best production rates, low maintenance cost and in general, satisfactory service. Much remains to be desired in the loose arrangements between the equipment manufacturer and the operator. The former is prone to withhold information so he can keep his competitor in ignorance and the operator is unwilling to divulge factors of his formulation. The entire field is filled with secrets and as a result, the best use has not been obtained with the ball mills. An attempt will be made to supply information in this paper so that ball mill operators can secure considerable increase in the output of the ball mills.

That improvements can be had is evident from the performance obtained by some operators. As an illustration of good operation a lined mill was relined in 1940 and a new ball charge purchased at the same time to supplement the ball charge on hand. This mill was in operation, grinding a porcelain slip of a sand and clay mixture for an average of 60 hours per week until 1957. The extra ball charge had practically been consumed in the seventeen year period, and the two inch lining was worn until it was one-fourth to three-eighths inch thick. This operator had earlier found how to balance ball size, ball charge, mill speed, material charge, material consistency, loading technique, cleaning, and mill maintenance to obtain the lowest cost operation. When the conditions of such operation are compared with laboratory and plant experiments to determine the effect of isolated factors, a reasonable pattern of guide lines can be recommended to the operator of the ball mills. It is believed that wet grinding of pigments or solids in the ball mill, for whatever purpose, should be performed under the same conditions in the laboratory and the plant mills.

Pigment Particle Size

Pigment particles that are to be dispersed are small and the size most desirable is only slightly larger than the wave length of the color that they represent. The colors with the shortest and longest wave length in the visible spectrum are violet and red with wave lengths of 0.4 to 0.7 micron. In order to obtain the maximum amount of color per pound of product it is desirable to reduce the size of the particles close to 1.0 micron.

The Hegman gage is a convenient tool to use to measure fineness of dispersion. A fine product may measure 7½ Hegman, which is a clearance in the gage of 7 micron. Actually the fact that dispersed particles are not touching one another, and are coated with dispersant that may be of relatively large molecular weight the largest pigment particles will be of the order of 2 to 3 micron at 7½ Hegman reading.

Most pigments are dry ground to size and in the process of grinding, many particles less than 1.0 micron are produced. These super-fine particles have a tendency to absorb gas that is later difficult to remove. An example of this is carbon black. Black, has most of the particles of a size less than the wave length of light; generally in 0.1 to 0.01 micron size. The amount of gas absorbed is very large compared to most pigments, and the large amount of work required to obtain a good dispersion is well known.

The superfine particles are held together in aggregates by energies much larger than the energy of wetting of the particles, and hence extra energy must be used to separate the very small particles. To avoid passing through this energy requirement, color flushing—passing from a water interphase to an organic vehicle without air drying—is used. Pigments dispersed this way have greater depth of color, and have less tendency to chalk, indicating that gas removal may not be as complete as intended when using dry pigments.

In a study made 20 years ago, a titanium pigment was dispersed by several different methods, but the product chalked badly in a short time. This pigment was then fractionated to size by a settling technique in solvents, dried, and each fraction separately dispersed. The fraction that was of about 1.0 micron size produced lacquer with gloss retention properties of the flushed pigments on exposure to atmospheric test. The coarse fraction of pigment could not meet the initial requirement of gloss, while the finer fractions showed greater tendency to chalk as the size became smaller. The difference in attraction for gas molecules on the surface of titanium dioxide is believed to be a large contributing factor in the difference in the behavior. This discussion of the importance of gas absorption is necessary for a realization of the action desirable for dispersing a pigment.

The specification for a pigment generally permits 0.1 to 0.01% to be retained on 325 mesh screen. While this is a small amount, it does represent a small portion that must be reduced in particle size in addition to being dispersed. In addition to this specification an oil absorption value is specified to insure that the major part of the pigment is in the size range desired. This means that when a pigment is dispersed, the consistency generally remains fairly constant while being dispersed, and that some pigment is reduced in particle size.

Consistency

The ability of pigmented slurries to resist flow forces such as found when measured in a viscometer arises from two factors. (1) The Newtonian viscosity of the vehicle, (2) The interaction of the particles adjacent to one another and separated by the vehicle. This latter

effect can result in several different manifestations.

A. In the simplest case, as the flow force is increased the apparent viscosity measured decreases with increasing rate of flow until the viscosity measured is that of the vehicle—plastic flow.

B. With higher density or population of particles an initial force is required before any movement is obtained, and then as greater flow rate is obtained the product becomes more and more fluid; this is plastic flow with a yield point.

C. With high density of particles, and probably of more uniform size, the slurry will set up to stiffer or higher yield point with time and after a force is reached greater than the yield force, the slurry acts as in plastic flow. This condition is exemplified by the new thixotropic paints that will remain in a can when inverted; however, when these paints are quickly stirred, the can contents will pour out easily.

D. Some slurries offer more resistance to flow as the flow rate is increased, resulting in a property know as dilatant. This property is rare and seems to be associated with systems that have uniform particle size, and the particle shape is other than spherical.

Most pigment grinding and dispersing involves systems that are in class B and C. The systems exhibit a yield point and usually are thixotropic. The measurement of the consistency of such slurries should be with instruments that approach the shear forces available in the dispersing equipment. The Krebs modification of the Stormer viscometer meets this requirement as well as any instrument, and is suggested for use for measuring the consistency of pastes. The shear rates with this instrument are great enough to overcome the thixotropic and yield point effect and generally measure the Newtonian and plastic effects.

The Krebs modification is essentially a flat paddle, and in Newtonian liquids the Reynolds Number-Torque or Power Number relationships can be used to predict the force required to obtain a given speed. A plot of this Power Number relationship is shown in Figure 1.

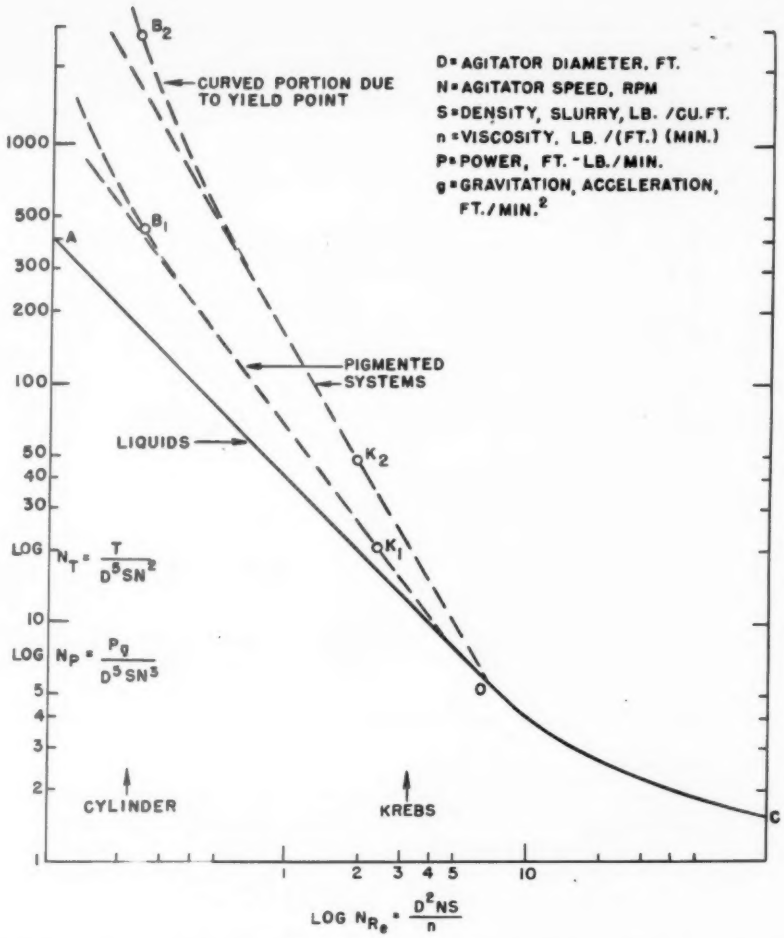


Figure 1. Power or torque number relationship to Reynolds number for rotating type viscometer.

For pigmented systems, when the consistency is determined with a Stormer instrument, the applica- of a greater force or weight is required to obtain the speed expected and we express this in KU units. It is well to associate viscosity with Newtonian liquids and for this reason not translate the KU units into centipoise of an equivalent Newtonian viscosity. The Stormer measures the consistency at a Reynolds Number of about 3. This is far enough away from the critical value "C" to be sure that the measurement is in the viscous region. The modified Stormer can not be used to measure viscosities of Newtonian liquids below 100 centipoise as this would then be at a Reynolds Number of "C" and the liquid may not be in viscous flow.

The cylindrical viscometers of many different designs measure the consistency at much lower shear rates at 2 to 10 r.p.m., and so the Reynolds Number is at least one magnitude less than for the Krebs modification of the Stormer. This means that the consistencies will be at higher values, usually 10 to 50 times greater. Further, the shear rates are often so low that yield point and thixotropic values are not entirely eliminated.

When a pigment is being dispersed, or a solid ground in a liquid the consistency increases as pigment aggregates are wet by the vehicle. It is possible that values K_1 and K_2 of Figure 1 would be obtained on a Krebs unit on successive tests made on samples taken a few minutes apart in the dispersion time. On a cylindrical type viscometer, the values may correspond to B_1 and

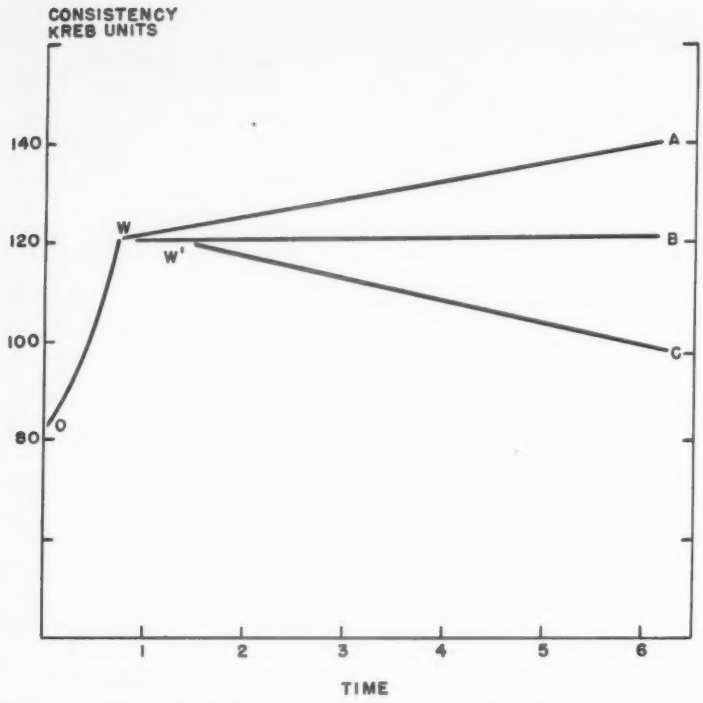


Figure 2. Effect of grinding time on consistency of paste being ground.

B_2 and some effects of yield point is often also measured.

The consistency of a solid suspension may change while being dispersed in several different ways. In Figure 2 are shown three paths that have been observed. The curve from O to W is the consistency increase as obtained in a ball mill resulting from mixing of the ingredients and removal of gas in large quantities. The increase progresses more rapidly as the clumps are broken up. A material that is easily dispersed and contains only a few aggregates to be wet will follow the line "WB". Agglomerates are formed as fast as the aggregates are broken up and the resulting plasticity remains approximately the same as at "W". Many products follow this course and product quality is determined by fineness readings taken on Hegman gage. The line "WA" is obtained if the solid is being reduced in particle size, or if aggregates are difficult to break down and form smaller agglomerates. The consistency increase indicates an increase in population of the number of particles of smaller size. The smaller particles have stronger forces to build up the plastic effect.

The materials that exhibit a decreasing consistency and follow a consistency curve "WC" or similar arrangement are believed to be forming agglomerates of larger size. These larger agglomerates may be forming because some material is going into solution that causes the surface properties of the solid to change or the release of absorbed gas may be a factor. The decreasing consistency with time may also be due to change in temperature. In all the dispersions the solid particles originally start as aggregates that are then wet by the vehicle. Generally, a portion of the vehicle is attracted to the surface of the solid and is preferentially absorbed. In this process a number of particles with absorbed vehicle are clustered together and form agglomerates. The number and size of these agglomerates will determine the plasticity of the product.

The difference between aggregate, deflocculate, flocculate, and agglomerate may be illustrated by wetting one cubic centimeter of fine dry titanium dioxide with dry benzene. The pigment originally is in aggregates and occupies a small space. If the pigment is wet with benzene to make a volume of 10 cubic centimeters, a paste of smooth consistency can be formed. This paste is thick, will show a high value for consistency, and will approach deflocculation. The individual particles will be separated one from another. If a crystal of fatty acid or other polar material is added to this suspension, the pigment will settle down to 1.5 to 2 cubic centimeter volume and be of pasty consistency. The result is a flocculated paste. The pigment concentration has been increased from 12 or 15 percent to 70 or 80 percent. If a resin or varnish is used to flocculate the pigment the pigment will flocculate and form agglomerates. Successful handling of coatings or pigment slurries requires a background of experience that will give the degree of flocculation desired for paint, ink, porcelain enamel, porcelain slip or coatings such as used in industry.

THE MOST DIVERSIFIED
LINE OF MICAS
STOCKED IN 24 CITIES
• BOSTON • NEW YORK • TRENTON • PHILADELPHIA
• BALTIMORE • AKRON • CLEVELAND • CINCINNATI
• LOUISVILLE • CHICAGO • ST. LOUIS • DES MOINES
• KANSAS CITY • TULSA • OKLAHOMA CITY • DALLAS
• HOUSTON • DENVER • SEATTLE • PORTLAND • SAN
FRANCISCO • LOS ANGELES • TORONTO • MONTREAL
The English Mica Co.
RIDGEWAY CENTER BUILDING, STAMFORD, CONN.

A good sign for everyone in the industry!

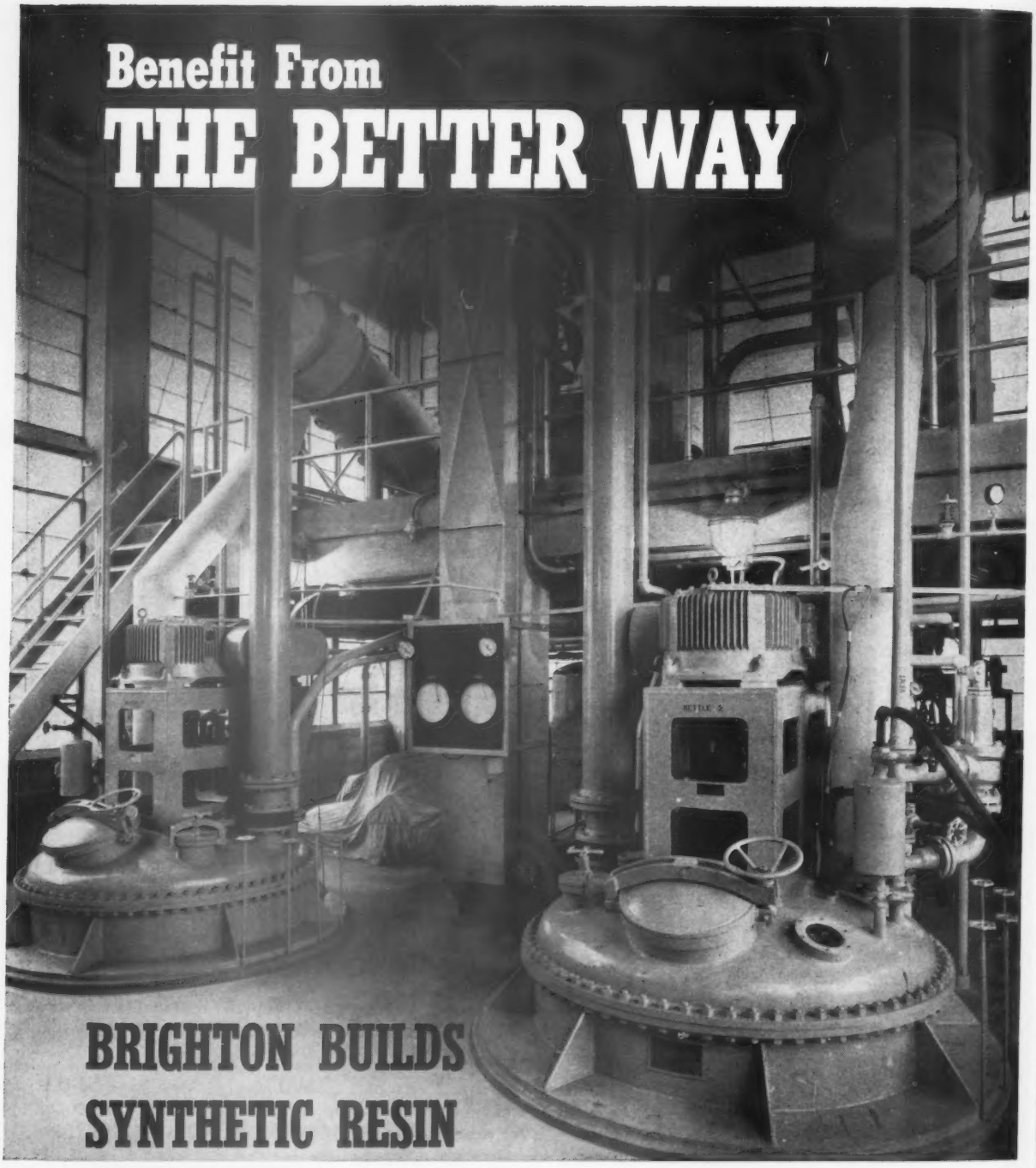
There are plenty of "wet paint" signs all over the country these days! Shows lots more people are fixing up, sprucing up and painting up. Paint sales show it too, with a healthy increase during 1959 . . . an increase for which Canco feels everyone in the industry deserves heartiest congratulations!

And Canco is proud to be a part of all this . . . especially proud that its many developments have been so widely accepted. The COLOR GUARD can, for example, is one of the most recent. It has many new features, including *clinched solderless ears that give this carry-safe can the strongest handle ever; smooth exterior surface unmarred by flux spatter; stronger bottom profile that prevents bulging; recessed plugs for safety and stackability.* Other new features under development and test will result in better COLOR GUARD cans for water base paints. More on this later!

COLOR GUARD is but one in a series of paint can developments by Canco. Call your Canco representative soon and let him tell you about the many sales-making advantages of Canco paint containers.

CANCO Division **AMERICAN CAN COMPANY**

New York • Chicago
New Orleans • San Francisco



REACTORS

■ ■ ■ Brighton Reactors speed efficiency, lower processing costs in alkyd type resins. Nearly a half century is reflected in development of Brighton Reactors, so designed to handle a variety of alkyds, yet flexible enough to meet the demands of modern processing. Other basic components available include the condenser, decanter-receiver, thinning tank, heating plant, control board.

For "The Better Way" consult Brighton Engineers for complete details on our synthetic resin reactors.

BRIGHTON

METALSMITHS EST. 1914

CORPORATION

820 STATE AVENUE · CINCINNATI 4, OHIO

STATISTICAL METHODS

Because the human mind is unable to grasp facts contained in large, unordered masses of data, it is necessary to rearrange, condense, or simplify these data in a meaningful way. The statistical method is a powerful tool toward this end.

Part I—Fundamentals

By

Lawrence Shatkin

Frequency Distribution

In order to analyze data, it is first necessary to arrange them systematically. The frequency distribution is a classification of numerical data according to size or magnitude.

Using the range of the data as a guide, the tabulations are divided into class intervals, which are determined by the number of values comprising the distribution. The more numerous the items making up the distribution, the larger the number of class intervals used. In general, a frequency distribution should not contain fewer than 8 to 10 classes or more than 20 to 25, depending upon the items in the series. Class intervals should not overlap, but be arranged as: 0 to less than 1, 1 to less than 2, etc. The lowest class interval is placed at the top of the tabulation, with larger classes following in order.

Unarranged data of viscosity values, in Kreb Units, of alkyd flat batches appear in Table 1.

70	84	91	102	83	99	107	96	85	77
91	88	83	91	100	93	91	70	79	75
90	83	89	102	102	110	95	97	82	79
86	91	98	88	91	93	90	91	88	72
84	88	98	82	102	83	93	91	85	86
85	89	78	82	73	77	76	76	79	76
83	83	71	82	102	93	78	74	75	90
85	89	97	93	87	108	85	88	80	88
78	87	69	81	79	106	90	83	104	85
112	110	91	103	83	86	90	90	96	106

Table 1.

This arrangement is difficult to comprehend. The first step in analyzing these figures would be to arrange them into a frequency distribution as depicted in Table 2.

The frequency distribution serves as a starting point from which other estimates or inferences can be drawn. It can be used to characterize a population quantitatively, or can serve as the basis for the selection of a sample and the calculation of the standard deviation. It can be used to organize, to summarize, and to present statistical data. These will be described later on.

Viscosity Values for 100 Alkyd Flat Paints

Class Interval Kreb Units	Frequency
65 to less than 70	1
70 " " " 75	6
75 " " " 80	14
80 " " " 85	17
85 " " " 90	19
90 " " " 95	20
95 " " " 100	8
100 " " " 105	8
105 " " " 110	4
110 " " " 115	3
Total	100

Table 2.—Frequency Distribution With 5 KU Class Interval

Shapes of Frequency Distributions

1. A symmetrical distribution is exemplified by a normal curve in

The opinions expressed in this feature are not necessarily those of any particular firm or organization.

which the peak is near the center, in the range of x values.

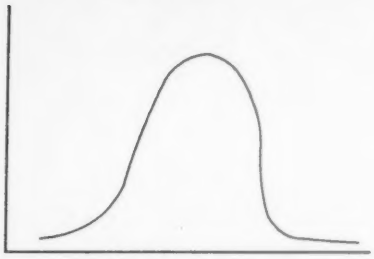


Fig. 1. Normal Curve

2. The curve in which the peak is in the lower part of the X-scale (abscissa) is a positive or right skewed distribution.

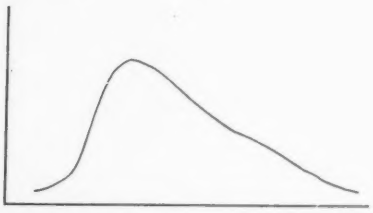


Fig. 2. Right Skewed Distribution

3. The curve having the peak in the upper part of the X-scale is negatively or left skewed.

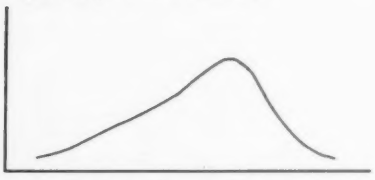


Fig. 3. Left Skewed Distribution

4. A distribution in which the frequencies are the same for all values of x does not have any pronounced peak, and is known as a square or rectangular distribution.

5. A curve having more than one prominent distribution peak is known as a multi-modal distribution. This is exhibited when wages are analyzed from two different areas or regions.

The arrangement of the data into a frequency distribution enables the investigator to apply further tools of statistics in order to help management make the best decisions.

Measures of Central Tendency

Measures of central tendency are the most common type of statistical measure used to characterize series of data. The arithmetic mean is the most important in theory and practice. It is commonly known as the "average."

Method of Calculating $\overline{X}$ (arithmetic mean)

The arithmetic mean is the sum of a series of variate values divided by the number of such values. The formula is:

$$\overline{X} = \frac{\Sigma X}{N}$$

$\overline{X}$ = arithmetic mean
Σ = symbol meaning "sum of"
X = data expressed in individual items
N = number of items

The above formula becomes more difficult as the number of items in the distribution increases. Therefore, the technique is to start from an arbitrary starting point or guessed mean (see table 3), and obtain the arithmetic mean from the following equation:

$$\overline{X} = \overline{Z} + \frac{\Sigma(fd)}{N}$$

$\overline{Z}$ = guessed mean
f = frequency of each class interval
d = deviation of midpoint of each group from guessed mean
N = total number of items

Fitting in the information from Table 3 into the above equation we get:

$$\overline{X} = \overline{Z} + \frac{\Sigma(fd)}{N}$$

$$= 87.5 + \frac{24}{100}$$

$$= 87.5 + .24$$

$$= 87.74$$

The value of the arithmetic mean can be greatly distorted by extreme values in the distribution. Two characteristics of the arithmetic mean should be emphasized: (1) the algebraic sum of the deviations about the arithmetic mean equals zero, and (2) the sum of the squares of the deviation from the mean is a minimum.

The Median

This is not a mathematical average. It is an average of location, where above and below may be found one half of the items in the distribution. The median is computed from grouped data by interpolation. The number of the desired item is first determined by N and, through cumulated fre-

$\frac{}{2}$

quencies, the class interval is located in which the median is contained and calculated by interpolation. This is illustrated by referring to Table 4, where N = 36 (kept small for simplicity), and

N Therefore, the median is

$\frac{}{2} = 18$.

located at the 18th value in the distribution.

$$\text{Median} = \text{Lme} + \frac{ic}{f}$$

Lme = lower value of class interval where median is located
i = number of cases needed within group
f = total number of cases in group
C = class interval limit

(1) Class Interval Krebs Units	(2) Midpoint (M.P.)	(3) frequency (f)	(4) deviation (d)	(5) frequency deviation fd
65 to less than 70	67.5	1	−4	− 4
70 " " " 75	72.5	6	−3	−18
75 " " " 80	77.5	14	−2	−28
80 " " " 85	82.5	17	−1	−17
85 " " " 90	87.5	19	0	0
90 " " " 95	92.5	20	1	20
95 " " " 100	97.5	8	2	16
100 " " " 105	102.5	8	3	24
105 " " " 110	107.5	4	4	16
110 " " " 115	112.5	3	5	15
		100		24

Table 3.—Computation of Arithmetic Mean—Short-Unit Deviation Method. Viscosity Values for 100 Alkyd Flat Paints (refer to Table 2).

Class Interval Per cent	frequency	cumulated frequency
0 to less than 1	4	4
1 " " " 2	11	15
2 " " " 3	13	28
3 " " " 4	5	33
4 " " " 5	0	33
5 " " " 6	1	34
6 " " " 7	1	35
7 " " " 8	0	35
8 " " " 9	0	35
9 " " " 10	0	35
10 " " " 11	1	36

Table 4.—Ratio of Net Profits on Net Sales for 36 Manufacturing Lines

The median for the distribution in Table 4 is:

$$2+\left(\frac{3}{13}\right)1=2+.23=2.23$$

The median is affected by the number of items, not by the size of extreme values.

Quartilies

The first quartile is the value below which will be found 25% of the values, and above 75% of the values. The second quartile, $\frac{N}{2}$, is equal to the median. The third quartile, $Q_3=\frac{3N}{4}$, has 25% of the values above, and 75% of the values below.

The Mode

The mode is the one that appears most frequently. The value of the mode is the class that has the most frequencies or the value of the maximum point of a frequency distribution.

$$\text{Mode}=\text{Lmo}+\frac{fa}{fa+fb}\,C$$

Lmo = lower limit of modal group
f_a = frequency of class interval below modal group
f_b = frequency of class interval below modal group
C = size of class interval

The great statistician Karl Pearson discovered the relationship between the mean, median and mode, in which the distance between the mean and the median is one-third of the distance between the mean and the mode. His formula is commonly expressed as: Mode = Means − 3 (Mean-Median). The mode is an average of position and is not affected by extreme values.

Dispersion and Skewness

Dispersion is the spread of the data. It has a strong bearing on the measure of central tendency. Five principal measures of dispersion occur in statistical work:

1. The range is the difference between the highest and lowest values;

2. The ten to ninety percent range, locking off the top and bottom 10% items;

3. Quartiles, $\frac{Q_3-Q_1}{2}=QD$. The median $\pm Q_D$ will embrace 50% of the items in the distribution;

4. The average deviation or mean deviation consists of the average of the deviations of the items from their arithmetic mean or median;

5. The standard deviation is the most important concept. It plays a very large part in correlation analysis and sampling.

Standard Deviation

It is sometimes referred to as the root-mean-square of the deviations from the arithmetic mean. The formula for the standard deviation is:

$$\sigma=\sqrt{\frac{\Sigma(x^2)}{N}}$$

σ = standard deviation
x = any deviation from the actual arithmetic mean
N = total number of items

Computation of Std. Deviation

When using the method based upon a frequency table, use an arbitrary origin and an assumed mean. A short cut method for calculating the standard deviation uses the following formula:

$$\sigma=\sqrt{\frac{\Sigma(fd^2)}{N}-\left(\frac{\Sigma fd}{N}\right)^2}$$

σ = standard deviation
d = deviation from arbitrary origin in class intervals
f = frequency
N = number of items in the distribution

Where the class intervals are uniform in size, calculations can be carried out in terms of class intervals and multiplying the final result by the class interval. The formula will then be:

$$\sigma=i\sqrt{\frac{\Sigma f(d')^2}{N}-\left(\frac{\Sigma fd}{N}\right)^2}$$

i = size of class interval

Referring to Table 3, we find that d′ and fd′ are the same values as d and fd given in columns (4) and (5). We can proceed to calculate fd′², which gives the following values for each of the class intervals:

16
54
56
17
0
20
32
72
64
75
406

$$\sigma=i\sqrt{\frac{\Sigma f(d')^2}{N}-\left(\frac{\Sigma fd}{N}\right)^2}$$

$$=5\sqrt{\frac{406}{100}-\left(\frac{24}{100}\right)^2}$$

$$\sigma=\sqrt{4}=5\times 2=10$$

Where the distribution is normal the following relationship holds:

$\bar{X}\pm 1\sigma$ = approximately 68% of the values will be included within the limits
$\bar{X}\pm 2\sigma$ = 95 % of the items in the distribution will be included
$\bar{X}\pm 3\sigma$ = 99.7% of the items in the distribution will be included

New Developments

New Resin-Bitumen Coating Developed by Shell Chemical

Shell Chemical Corp. has developed a new, low-cost resin-bitumen coating especially suited for use as an economical corrosion-resistant coating for pipe and other metal equipment and on concrete surfaces.

The new coating, based on EPON 828 and Bitumen C, a compatibilized bitumen which the company will market, has greater chemical resistance than existing epoxy-coal tar enamels. Two-month immersion tests showed it to be unaffected by many acids and other corrosive materials.

This high solids coating is outstanding as a one-coat, inexpensive maintenance coating, the company reports. It is suggested for use on the inside and outside of pipe, on offshore drilling rigs and for service in any area subject to corrosive chemical fumes and spillage.

Because of its excellent adhesion, toughness, and resistance to water, it is also ideally suited for use on exterior and interior concrete walls below ground level, roof coating, silos and hopper cars and other railroad rolling stock.

Latex Paint Vehicle Marking New Gains

A new vehicle for gloss latex paints, recently introduced by the U B S Chemical Co., Cambridge, Mass., is making important gains in the paint industry.

An acrylic co-polymer emulsion known as *U-7001 Ubatol*, was launched by the firm last November and represents the newest entry among polymer emulsions used in water based paints.

According to the company, the fact that *U-7001 Ubatol* is now being evaluated by the majority of paint manufacturers across the country is an indication that potential sales from this product will bolster the aim for greater product diversification.

U-7001 Ubatol is a logical outgrowth of the many attempts in the past to make a superior gloss latex paint. Upon simple air drying, latex paints formulated with U-7001 will result in a hard, dry, water resistant paint film with no residual tack. In addition, it will retain its gloss both in the package and in the dried film, the manufacturer reports.

New Epoxy Novolac Resin Gives Better Service

Development of an epoxy novolac resin giving better high temperature service than conventional epoxy resins, is announced by The Dow Chemical Co., Midland, Mich.

The new resin, *D. E. N. 438*, has been field tested in laminating, casting and adhesive applications for two years. The product appears to combine the useful physical and handling properties of conventional epoxies with the high temperature performance of phenolic resins.

try this formula with

CARBIUM®

It provides lower-cost medium gloss

WHITE INDUSTRIAL ALKYD ENAMELS

Carbium . . . Diamond's new dense precipitated calcium carbonate has outstanding flatting properties in medium gloss industrial coatings.

Properties obtained with the above formula are as follows:

60° Gloss Reading.....50°
Grind Gage Reading.....5+
Initial Viscosity.....78 KU
Film Appearance .....Smooth
Settling (1 month).....None

By using only a single extender pigment, raw material costs are reduced. For complete details on cost reduction and improved flatting properties through use of CARBIUM, write Diamond Alkali Company, 300 Union Commerce Building, Cleveland 14, Ohio.

	Pounds/100 gals.
Rutile Titanium Dioxide	254.0
CARBIUM	353.0
Lecithin	3.0
Aluminum Stearate	3.0
Long Oil Alkyd (70% solids)	166.0
Mineral Spirits	133.0
Pebble mill grind for 16 hours and add:	
Long Oil Alkyd (70% solids)	246.5
Mineral Spirits	20.0
6% Cobalt Naphthenate	3.0
24% Lead Naphthenate	1.3
5% Calcium Naphthenate	1.0
TOTAL	1,183.8

Diamond Chemicals®

ut-
ve
ny
on
on
ce
ve

n,
r,
on
ls
g,
l-

x
e,
s

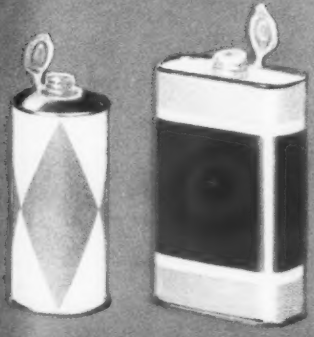
n
s

Hats off to the NEW

with dripless pour spout!

A development of Continental research

Presenting new packaging beauty, convenience and economy for practically all liquids and granulated products now packaged in round or oblong nozzle-type cans



The cap can't get lost or switched with Continental's new plastic Flip Cap*. It's permanently hinged to the dripless pouring spout. Holds back to permit free pouring—yet snaps shut to stay. The Flip Cap unit is inserted after filling, automatically if you wish at 200 per minute. This permits higher filling speeds, through a larger opening. Moreover, freedom from solder splashes and flux marks permits lithography on the top of the can as well as sides. The Flip Cap nozzle can be supplied in various colors, and the cap design can be stylized as desired. Ask your Continental man.

*Patents pending.

CONTINENTAL CAN COMPANY

Eastern Division: 100 E. 42nd St., New York 17
Central Division: 135 S. La Salle St., Chicago 3
Pacific Division: Russ Building, San Francisco 4
Canadian Division: 790 Bay St., Toronto 1
Cuban Office: Apartado 1709, Havana, Cuba

NOW...

THERE'S MORE FATTY ACID PER POUND IN THE ALL-NEW PAMAK® 4A

When Pamak 4A, the standard of the industry, was introduced in October of 1957, it was the first of the lower priced tall oil fatty acids with all of the properties needed for use in high-quality alkyd resins.

Now, two years later, Pamak 4A is again improved to set new standards of value for alkyds. Color is lighter. Rosin content is reduced. And undesirable unsaponifiables are held to a new minimum.

The result—there's more fatty acid in each pound; more resin-making ingredient; less waste.

So—why not put this all-new Pamak 4A to work for you today. Write, wire, or phone your PMC Pamak specialist.

Paper Makers Chemical Department

HERCULES POWDER COMPANY

INCORPORATED

Wilmington 99, Delaware

PT59-1

ETHYL ALCOHOL

ISOPROPYL ALCOHOL

SECONDARY BUTYL ALCOHOL

ACETONE

METHYL ETHYL KETONE

ETHYL ACETATE

ISOPROPYL ACETATE

SECONDARY BUTYL ACETATE

ENJAY SOLVENTS

For maximum solvent power at minimum solvent cost

You'll find that Enjay is a dependable source for oxygenated solvents for many surface coatings. Enjay Alcohols, Esters and Ketones are being used throughout the surface coatings industry to provide maximum performance at minimum cost. Enjay solvents are available from conveniently located storage facilities for drum, tank car or tank truck delivery. Enjay's complete technical facilities are always at your service to assist with the application of any Enjay chemical.

FOR PROMPT DELIVERY OR TECHNICAL ASSISTANCE . . . *phone or write the Enjay Office nearest you.*

EXCITING NEW PRODUCTS THROUGH PETRO-CHEMISTRY

ENJAY COMPANY, INC.

15 West 51st Street, New York 19, N.Y.

Akron • Boston • Charlotte • Chicago • Detroit • Los Angeles • New Orleans • Tulsa

ENJAY

PETROCHEMICALS

From the **HIGHEST** to the **LOWEST**

there's an

AZO

lead-free

ZINC OXIDE

that gives you the exact consistency your paint requires

OTHER GRADES OF AZO ZINC OXIDES IN A WIDE RANGE OF OIL ABSORPTIONS

Where necessary to meet your requirements we can select within grades the *exact* degree of desired oil absorption.

NOTE: AZO paint grade zinc oxides available as AZODOX (de-aerated). AZODOX has twice the apparent density, half the dry bulk of conventional oxides.

1ST

American Zinc was the first, *and is still the only* producer of acicular lead-free zinc oxides covering a wide range of oil absorptions from high to low *and including the intermediate ranges.*

For Example:

When high consistency is wanted, use . . .

AZO ZZZ-22

This is the original high oil absorption acicular zinc oxide. The unusual weathering properties imparted to paints by AZO acicular type zinc oxides are present to the highest degree in AZO ZZZ-22.

When very low consistency is wanted, use . . .

AZO ZZZ-55 or AZO ZZZ-55-LO

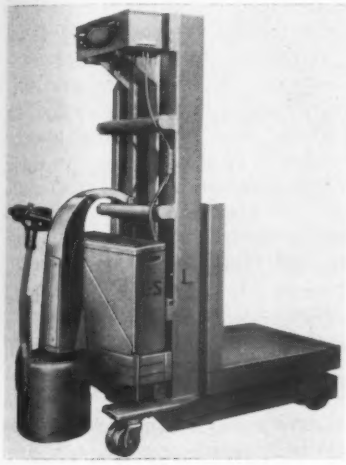
Highly recommended for general paint formulations where very low oil absorption zinc oxide is desired. Absence of colloidal fines assures good weathering characteristics. Round particle shape.

American Zinc sales company

Distributors for AMERICAN ZINC, LEAD & SMELTING COMPANY
COLUMBUS, OHIO • CHICAGO • ST. LOUIS • NEW YORK

NEW EQUIPMENT AND MATERIALS

This section is intended to keep our readers informed of new materials and equipment. While every effort is made to include only reputable products, their presence here does not constitute an official endorsement.



LEWIS-SHEPARD

PLATFORM TRUCK
19,000 lb. Capacity

Special high-capacity, high-lift platform "walkie" truck with capacities up to 19,000 pounds has been designed and is now manufactured by Lewis-Shepard Products, Inc.

Designed to solve high capacity handling problems in limited maneuvering areas, the powerful 24-volt Jackstacker solves many applications where heavy duty fork lift trucks cannot be used.

Ideal for handling heavy dies from storage to processing areas, this special "walkie" design can be constructed to meet most customer demands in capacity, speed and space requirements.

Lewis-Shepard Products, Inc., Dept. PVP-R10-1, 125 Walnut St., Watertown 72, Mass.

FURNACE ACCESSORIES
Safety Handle

New functional accessory groups that let one model electric furnace perform several operations has been announced. The following accessories make the Type 2100 furnace even more adaptable and versatile than before as a salt bath, oil bath, melting, vertical muffle or crucible furnace, the company claims: two special-alloy stainless steel pots with cover for liquid heating to 1000°F. and 1600°F., a safety lifting handle for the pots, a perforated stainless steel small parts basket with lifting handle, a perforated stainless steel skimmer for removing sludge or crust, a graphite melting ladle for use to 1700°F. with unique no-slip lifting handle, a high-temperature refractory chamber liner, and a heavy refractory chamber cover.

Thermo Electric Mfg. Co., Dept. PVP, 559 Huff St. Dubuque, Iowa.

HAROLD L. PALMER

DRUM WARMER
Eliminates Hot Spots

New, fully automatic, 5-gallon drum warmer that quickly heats viscous materials and maintains them at the temperature and consistency required for easy removal from drums has been announced.

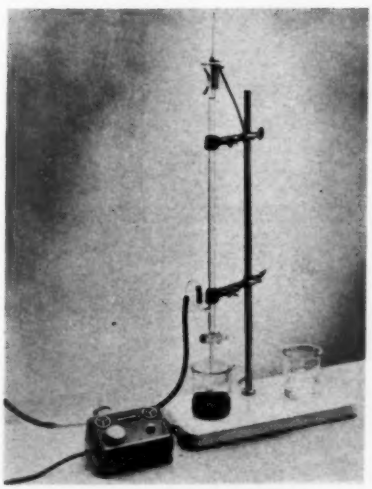
The unit is designed to warm 5-gallon drums containing heavy-duty industrial materials such as tar, asphalt, resin, glue, mastics and adhesives, oil, grease, varnish, paint and putty, as well as more sensitive substances used commercially such as shortening, syrup, chocolate and other high-viscosity compounds. According to the manufacturer, the 5-gallon drum warmer safely and economically maintains materials at a controlled temperature on a round-the-clock basis—permitting instant removal and use regardless of surrounding temperatures. Baffled radiation eliminates hot-spots.

Additional features include: choice of two thermostatically-controlled temperature ranges, 60°—250°F., or 200°—550°F.; 2-inch sheet fiberglas insulation; aluminum reflector; wire-reinforced flexible asbestos gasket for snug fit around drum. The unit plugs into any 110-120 volt outlet, weights 22 pounds and is equipped with handles for easy portability.

Harold L. Palmer Co., Dept. PVP, 28625 Grand River Ave., Farmington, Mich.

AUTOMATIC FILLER
No Drains or Traps Needed

New Model 27 Autofiller reportedly can cut titration time up to 30%. It increases accuracy and reduces titration cost by eliminating the need for manual replenishment and adjustment of burette contents to volumetric zero



COLEMAN INSTRUMENTS

for each titration. After each titration, the operator pushes a button on the control box; the Autofiller allows titrant to flow into the burette and stops it automatically when the titrant reaches a sensing probe placed at the zero level. The burette is now filled exactly to the mark and is ready for the next titration. The Autofiller thus provides "push-button" automatic burette refill to an exact zero level without attention or adjustment.

The Model 27 Autofiller needs no drains or overflow traps. It can be used with any standard 5, 10, 25 or 50 ml, open top, side-fill burette and with any titrant sufficiently ionized to be electrically conductive.

Coleman Instruments Inc., Dept. PVP, 42 Madison St., Maywood, Ill.

PLASTICIZER
Good flexibility retention

Plasticizer-Surfactant, is said to combine both plasticizer and surfactant activities in one product.

As the result of tests made by the firm in its laboratories, the following advantages are claimed by the firm: excellent plasticizing action, extremely low temperature coalescence, very definite improvement in scrubbability, and definite improvement in flexibility and flexibility retention under adverse conditions, such as elevated temperatures.

Two products are available—*P. S. 77* and *P. S. 99*. *P. S. 99* is especially recommended for butadiene-styrene emulsion paints.

Advance Solvents & Chemical, Dept. PVP, 500 Jersey Ave., New Brunswick, N. J.

SILICONE FLUIDS
Soluble in low alcohols

Two new silicone fluids are said to exhibit unusual compatability with a diversity of materials.

Identified as XF-1030 and XF-1031, both fluids offer a combination of properties not available in any other silicone, the manufacturer says. Like conventional silicone fluids, they are soluble in aromatic and chlorinated hydrocarbons. However, due to their unique composition, XF-1030 and-1031 are also soluble in many alipathic hydrocarbons and lower alcohols, including ethanol.

Another unique feature of these fluids claimed by the company is their ability to self-emulsify in water. Both XF-1030 and-1031 instantly disperse in water with a minimum of stirring, forming a relatively stable emulsion.

These fluids have release and slip properties typical of all silicones. Properties shared by both include a specific gravity of 1.02-1.03 at 25°C. and a pour point of approximately −60°C.

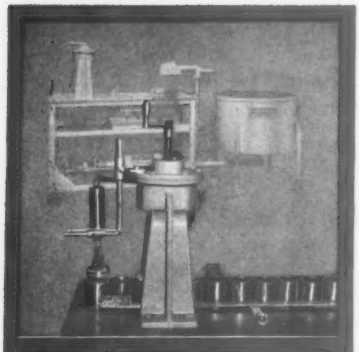
Due to the many unusual features of these silicone fluids, the firm expects them to meet a variety of application requirements throughout industry. Among the suggested uses are release applications where removal of silicone by an alcohol or water wash is desirable; as a paint additive to eliminate pigment flotation and cratering; and in the manufacture of cosmetics where it is desirable to combine the protection of silicone with a fluid having alcohol solubility.

Silicone Products Dept., General Electric Co., Dept. PVP, Waterford, New York.

CLOSING MACHINE
For inserting caps

Following up last year's introduction of its Flip Cap, a polyethylene nozzle with a permanently attached cap for use on round

SPEED OUTPUT... CUT COSTS
with these Time-Tested Portable
FILLING and SEALING MACHINES

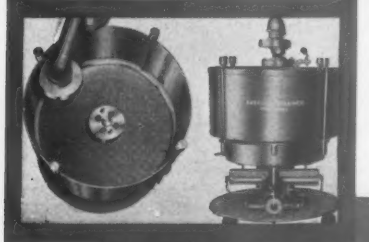


MODEL PF-9C
FILLS, SEALS, COUNTS, CODES

With this air-operated, portable machine, ONE OPERATOR seals, fills, counts and codes HALF-PINTS 30 to 35 a minute. PINTS or QUARTS 25 to 30 per minute. ½-GALLONS, 18 to 20; GALLONS, 16 to 18. No materials wasted. Accurate No-Drip Nozzle delivers a clean package. Used by major Paint manufacturers. (U.S.A. and Foreign).

MODEL DPF 5-1
COMBINATION FILLER and SEALER of LUG or RING-TYPE PAILS

This duplex air-operated unit fills and seals PER MINUTE 6 to 8 *FIVE*-GALLON PAILS —8 to 12 *TWO*-GALLON PAILS—14 to 16 *ONE*-GALLON (depending on viscosity of product). It stops the waste of old-fashioned handling of heavy containers with SAFE, CLEAN, ACCURATE production methods. Needs only one man and 60 lbs. plant air. Endorsed by leading Paint Manufacturers.



MODEL PSM-2
SELF-CLEANING, HIGH-PRODUCTION STRAINER

Constructed of non-corrosive metals throughout, this portable Self-Cleaning Strainer has INTERCHANGEABLE SCREENS 10 to 250 mesh. Built for lasting heavy-duty production, it cleans high viscosity fluids 30 GALLONS A MINUTE. Gearless, safety air-powered. An evolution in paint-straining equipment for all Paint, Varnish and Lacquer Manufacturers or Processors of industrial, chemical, or food oils and fluids.

Write to Dept. PV-3

C. M. AMBROSE CO.
4416 WHITE BUILDING
SEATTLE 1, WASH.
Since 1935

NEW
MATERIALS — EQUIPMENT

CONTINENTAL CAN

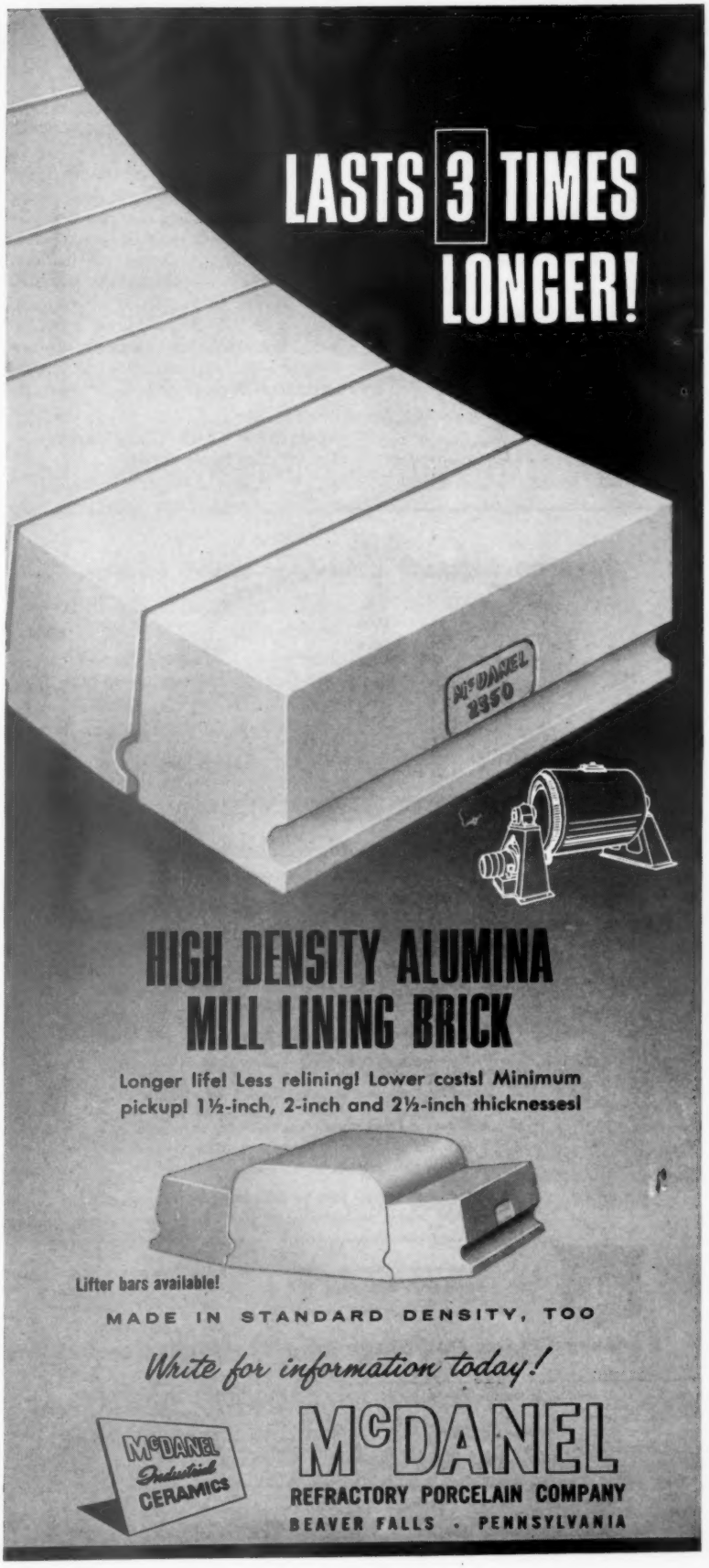
and oblong nozzle-type cans, Continental Can Co. announces the availability of a hand operated closing machine to insert the cap on the can and close it.

Metal cans using the Flip Cap are delivered to packers with a large perforated top opening, rather than the smaller threaded metal nozzle opening, to permit faster product filling. The Flip Cap must be inserted into the specially curled perforation by the packer, after filling.

While equipment is available for automatic, high speed insertion of caps, the firm believes the new Flip Cap Closer will find a market among smaller packers who can use an inexpensive machine that can be operated at speeds of 20 cans a minute or more, depending upon manual operator's facility. The all-steel machine weighs 14 pounds, is set on a 10″ x 10″ base to be bolted to a work bench, and has a height of 16″.

In its operation, a Flip Cap is hand-placed on the top opening of a can, then a round plate presses the cap firmly into the curled opening. Although nozzles are delivered with the captive cap seated in the closed position, the machine will also close any partially-opened caps as it does the inserting job.

Continental Can Co., Dept. PVP, 100 East 42nd St., New York 17, New York.


LASTS 3 TIMES LONGER!
McDANEL 2950
HIGH DENSITY ALUMINA MILL LINING BRICK
Longer life! Less relining! Lower costs! Minimum pickup! 1½-inch, 2-inch and 2½-inch thicknesses!
Lifter bars available!
MADE IN STANDARD DENSITY, TOO
Write for information today!
McDANEL Industrial CERAMICS
McDANEL
REFRACTORY PORCELAIN COMPANY
BEAVER FALLS · PENNSYLVANIA

PATENTS

Complete copies of any patents or trade-mark registration reported below may be obtained by sending 50c for each copy desired (to foreign countries $1.00 per copy) to the publisher.

Synthetic Drying Oils

U. S. Patent 2,918,440. Alexander M. Partansky, Concord, Calif. Assignor to The Dow Chemical Co., Midland, Mich. a Corp. of Delaware.

An esterification product of (1) a resinous poly-alcohol consisting of the etherified product of a phenol-formaldehyde novolak which is the reaction product of phenol and formaldehyde and which has from three to ten phenolic units per molecule in which at least about 70 percent of the phenolic hydroxide groups originally present in the molecule are etherified with from 0.2 to 1.2 moles per each phenolic unit of styrene oxide and (2) carboxylic acids in an amount to provide at least about 0.2 to 1.0 carboxyl groups per alcoholic hydroxyl of said resinous polyalcohol, at least about 60 percent of the carboxyl groups being furnished by fatty acids having drying characteristics said fatty acids being monomeric acids selected from the group consisting of those obtained by saponification of drying oils, semi-drying oils, and mixtures thereof.

Applying A Thick Film Coating To Articles By Dipping

U. S. Patent 2,922,725. Edgard F. Kempen, St. Louis, Mo., assignor to The Donlite Co., St. Louis, Mo.

In the application of a coating to an article, the process that comprises dipping the article within a liquid coating composition having predetermined flow and solidifying characteristics, withdrawing said article from the coating composition at a speed substantially in excess of said predetermined flow characteristic so as to pick up a substantial excess of mobile liquid coating composition, immediately swinging the article about a horizontal axis at a predetermined speed just sufficient to prevent any drain of the coating composition from the article, said rotational speed thereby being sufficient to cause the excess mobile portion of the coating composition initially to flow substantially across the article, and continuing each swinging rotation uninterrupted at said predetermined speed until the coating composition solidifies, said coating composition being of a character such that solidification proceeds gradually as the excess mobile portion thereof flows back and forth across the article during rotation and complete solidification occurring only after the article has received a substantial number of revolutions.

Wood Stains

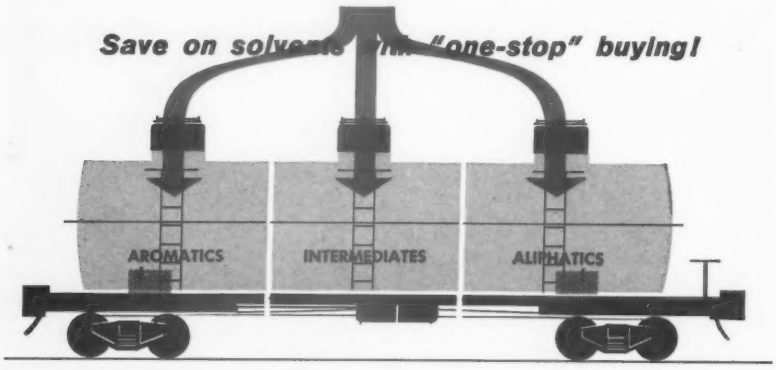
U. S. Patent 2,921,829. Leo J. Novak, Dayton, Ohio, assignor to Commonwealth Engineering Co. of Ohio, Dayton, Ohio.

A process for producing a wood stain which comprises the steps of diazotizing aniline with sodium nitrite and hydrochloric acid and neutralizing the resultant benzenediazonium solution with sodium hydroxide, acidifying the resultant product, and extracting the brown coloring constituent with toluene to provide a staining composition comprising a mixture of sodium isodiazotate and benzenenitrosoamine, said solution having a pH of between about 40. and 6.5.

Powdery Stabilizer Compositions For Vinyl Chloride Resins

U. S. Patent 2,921,917. Stanley H. Longman, Little Silver, N. J., assignor to Carlisle Chemical Works, Inc., Reading, Ohio.

A method of stabilizing halogen-containing resins with a liquid stabilizer in an amount of about .5 to 5 percent by weight of said resin, said method comprising first mixing a powdery halogen-containing resin consisting of at least 65 percent of units of a member of the group consisting of vinyl chloride and vinylidene chloride, the balance being essentially units of an unsaturated compound copolymerizable therewith, with about 25 to 60 percent by weight of a stabilizer which is liquid at room temperature and selected from the group consisting of organotin compounds, organic antimony compounds, and soap



ESPESOL SOLVENTS

ONE-SOURCE SUPPLY!

Buy all your solvents at one place . . . at one time!

- **Save on Freight Costs** Smaller, multi-product orders are shipped in compartment lots by tank car, transport truck, barge and ship and enjoy bulk rates.
- **Reduce Inventory Costs** Less capital tied up in inventory because stock on hand is kept to minimum. Losses from evaporation and other causes greatly reduced. Fresh stock insured at all times.
- **"Package" Delivery Ideal for Small Buyers** Combining small lots into one shipment reduces purchasing agent's work, simplifies unloading and handling, and insures all products arriving at one time to minimize production delays.
- **Immediate Availability** Eastern States' conveniently located terminals insure quick delivery to all points.

Eastern States Petroleum and Chemical Company
A Division of Signal Oil and Gas Company

Eastern States Petroleum and Chemical Company
P. O. Box 5008
Houston 12, Texas
Please send additional information on Espesol's ONE SOURCE SUPPLY! PPV-360
Name
Title
Company
Address
City Zone State

Post Office Box 5008—Houston 12, Texas—Phone WAlnut 3-1681
Chicago Office: 1011 Lake St., Oak Park, Illinois, Phone VIllage 8-5410
New York Office: 10 Rockefeller Plaza, New York, Phone Circle 7-2520
Cleveland Office: 20800 Center Ridge Rd., Cleveland, Ohio, Phone EDison 3-018
Louisville Office: 4th and Broadway St., Louisville, Ky., Phone JUniper 3-7634
Atlanta Office: 3121 Maple Drive, N.E., Phone CEdar 3-3227
Los Angeles Office: 110 S. Euclid, Pasadena, Phone MUrray 1-0278

U. S. Terminals:
Houston, Texas • Chicago, Illinois • East Liverpool, Ohio
Madison, Indiana • Brownsville, Texas • Savannah, Georgia
Carteret, New Jersey • Los Angeles, California

European Terminals:
Dordrecht (Rotterdam) Netherlands
Livorno (Leghorn), Italy

Five Reasons Why ASBESTINE® 325 Improves Products, Saves Money

ASBESTINE 325, the first "tailored" magnesium silicate of the famous ASBESTINE family, displays several advantages which can save you money and improve your products. That's why ASBESTINE 325 is popular as the sole functional pigment in many house paints, finds increased use in other finishes and is included in numerous coatings' research and development programs.

Here are five important reasons why you can expect ASBESTINE 325 to upgrade performance and lower costs in your current formulations or those you are developing:

1. ***Lowers Oil Demand***—Proper selection of ore combined with "tailored" particle size distribution, i.e., oversize particles removed, intermediate sizes balanced and fines proportioned, accomplish this result.

2. ***Reduces Grinding Time***—Is a stir-in grade. Absence of large particles and agglomerates, combined with its easy wetting characteristics, effect a Hegman of 4-4½ in minimum time with conventional mixing equipment.

3. ***Improves Leveling***—Paints properly formulated with ASBESTINE 325 tend to exhibit improved sag resistance, easier brushability, and better leveling.

4. ***Aids Wetting***—In oil, oleoresinous or water emulsion formulations ASBESTINE 325 wets easily. Because it wets readily, complete dispersion can be expected quickly and suspension maintained. Does not have after-wetting tendencies.

5. ***Lengthens Shelf Life***—Tests show paints made with ASBESTINE 325 resist hard settling—even after prolonged storage. Fluid consistency is restored with quick agitation because of soft settling properties.

For Further information on, or samples of ASBESTINE 325, write today. Let us help you to improved surface coatings at lower cost.

ONLY PRODUCER OF ASBESTINE

INTERNATIONAL TALC CO., INC.

WORLD'S LARGEST PRODUCER OF TALC

90 WEST STREET, NEW YORK 6, N.Y.

Cable Address
FIJAMENTE

Warehouse stocks carried by representatives in Principal Cities throughout United States and Canada

of a metal selected from the group consisting of alkaline earth metals, cadmium, zinc, lead, and tin, with an aliphatic carboxylic acid containing more than 6 carbon atoms, heating said mixture to a temperature of about 175 to 200°F., cooling said mixture, thereby obtaining a free flowing resin powder rich in stabilizer, and adding said powder to additional amounts of said halogen-containing resin in such a proportion that the final blend contains about .5 to 5 percent of the stabilizer.

Polymeric Composition

U. S. Patent 2,921,043. Carl A. Uraneck, Phillips, Tex., assignor to Phillips Petroleum Co., a Corp. of Delaware.

A polymeric composition of matter comprising an intermolecular neutralization product of a polymer prepared by copolymerizing 50 to 90 weight percent conjugated diene of 4 to 8 carbon atoms with 50 to 10 weight percent of a carboxylic acid containing a polymerizable ethylenic unsaturation and a polymer prepared by copolymerizing 50 to 90 weight percent conjugated diene of 4 to 8 carbon atoms with 50 to 10 weight percent of an amine containing a vinylidene group attached to a carbon atom, said amine being selected from the group consisting of primary, secondary and tertiary amines.

Coating Composition Comprising Nitrocellulose & Alkyd Resin

U. S. Patent 2,920,054. Aloysius Norbert Walus, Flint, Mich., assignor to E. I. du Pont de Nemours & Co., Wilmington, Del., a Corp. of Delaware.

A light-colored liquid coating composition, which produces a dry coating characterized by resistance to discoloration from contact with oil, grease, tar, rubbery adhesives and the like, comprising pigment, volatile organic solvent and organic film-forming material consisting of (*a*) lacquer grade nitrocellulose and, for each part by weight of nitrocellulose, (*b*) 0.5-1.5 parts by weight of alkyd resin containing a phthalic acid moiety, containing unesterified hydroxyl groups equivalent to 1.5%-7% by weight of glycerine, having an acid number less than 15, and being modified with 40%-50% by weight of hydrogenated castor oil, said oil having an iodine number less than 8, and (*c*) up to 0.6 part by weight of plasticizer; the total weight of (*b*) plus (*c*) being 1.0-1.5 times the weight of (*a*).

Coating Compositions

U. S. Patent 2,921,769. William P. Cody, Lombard, Ill., assignor, by mesne assignments to Reichhold Chemicals, Inc., White Plains, N. Y.

A thixotropic pigmented coating composition comprising a liquid vehicle and pigment, said vehicle comprising essentially volatile solvent and a resinous base of oil-modified alkyd resin, said vehicle comprising as additives a small quantity of a combination of materials which are a polyester and a calcium drier salt of an organic acid which salt is soluble in the vehicle, and which combination imparts to the composition increased thixotropic viscosity, the polyester having an acid number in the range from 2 to 30 and being the condensation product of polyhydric alcohol with a polymerized unsaturated 18-carbon fatty acid containing predominantly the dimer of said fatty acid, said polyhydric alcohol being selected from the group consisting of ethylene glycol, propylene glycol and butylene glycol, and mixtures containing a major proportion of at least one of said glycols with a minor proportion of trimethylolethane.

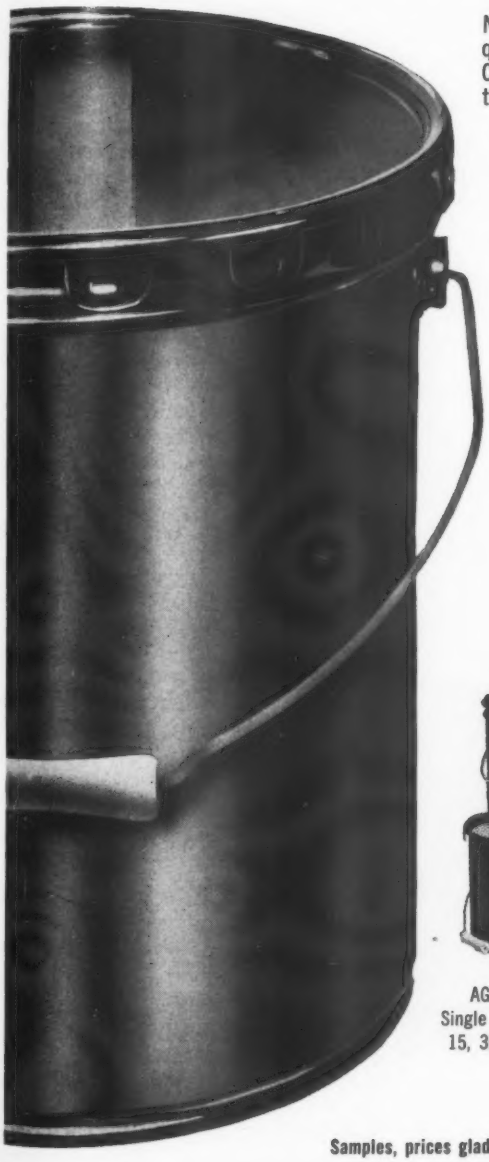
Resinous Products

U. S. Patent 2,921,921. Frank P. Greenspan, Buffalo and Rupert E. Light, Jr., Kenmore, N. Y., assignors to Food Machinery and Chemical Corp.

Thermosetting, organic solvent soluble composition useful in the preparation of thermoset resinous products, said composition comprising (*a*) the reaction product of a polybutadiene having a molecular weight of 250 to 250,000 and containing as polymer forming units only butadienes with a 1 to 10 carbon atom lower aliphatic peracid and containing at least 1% of oxirane oxygen, and (*b*) a polymercaptan from the group consisting of the alkylene dimercaptans and the terminal dimercaptan reaction products of the alkylene dihalides and sodium tetrasulfide, said polymercaptan being present in an amount of at least 10% of the stoichiometric amount required for complete reaction with the oxirane oxygen in said reaction product.

COMPATIBLE!
with both water and oil systems,
You can send for samples and brochures, of course. But it's a lot faster to take your color problem directly to our sales service laboratory. Call today.
Kodis
COLORS
UNIVERSAL CONCENTRATES
Experts in Color Technology for more than a Century. Since 1851.
H. KOHNSTAMM & COMPANY, INC.
161 Avenue of the Americas, New York 13
11-13 E. Illinois St., Chicago 11 • 2632 E. 54 St., Huntington Pk., Calif.

PAILS and DRUMS for the PAINT TRADE



NOW! — ALL your Pail and Drum needs can be served quickly and easily from one source . . . Vulcan Steel Container Co.'s modern plant located in the heart of the industrial South.

- PROVEN QUALITY STEEL PAILS AND DRUMS in a FULL RANGE OF SIZES from 1 to 65 gallon.
- ALL STYLES
  Open Head
  Closed Head
- POURING SPOUTS and NOZZLE OPENINGS of all popular styles supplied on our Pails and Drums.

2-Gallon Pails, Plain, Hi-Baked Lined, Lithographed

- HI-BAKE LININGS, proven-in-use for Latex, water emulsion and PVA paints, and hard-to-hold chemicals, available in all styles, all sizes.
- WAREHOUSE STOCKS: Large stocks of all popular sizes and styles regularly carried in paint and Field warehouses. Available for prompt shipment, or "ready" pickup by customer's trucks.
- GUARANTEED: FAST DEPENDABLE, PERSONALIZED SERVICE IS YOURS from this independent Southern plant.

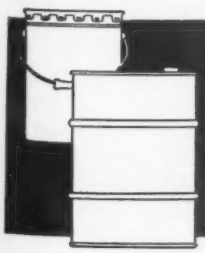
PUTTY KITS
25, 50, 100 pound sizes

Our expert LITHOGRAPHING in nonmar, full-range, perma-colors helps your Pails produce extra sales.

Drum-Type Closed-Head container for Paint and Chemicals — all sizes, all popular pour spouts.

AGITATOR DRUMS
Single and Double Blade
15, 30, 55 gallon sizes

Samples, prices gladly furnished. Write, wire, phone



VULCAN STEEL CONTAINER CO.

Main Office and Factory

3315 35th AVE., N. • P. O. BOX 786 • BIRMINGHAM, ALABAMA

TECHNICAL Bulletins

POLYCARBONATE RESINS

New, 12-page, illustrated brochure, describing a complete line of polycarbonate resins, phenolic resins, varnishes and molding powders, and fused magnesium oxide, has been issued.

The new catalog, reproduced from the 1960 Sweet's Product Design File, covers product features, special properties, and detailed technical data on *G-E Lexan* polycarbonate resins, phenolic molding powders, phenolic laminating varnishes, phenolic foundry resins, *Methylon* coating resins, phenolic industrial resins and varnishes, and electrically fused magnesium oxide.

The booklet has been compiled as an aid to designers, molders, fabricators, formulators, and end-users, in the specification of polycarbonate, phenolic and magnesium oxide materials.

Chemical Materials Dept., General Electric Co., Dept. PVP, One Plastics Ave., Pittsfield, Mass.

COATING COMPOUNDS

A brochure describing a method of application of coating compounds to small articles, such as electrical and electronic components at a rate of 4000 per hour, is being offered.

It tells how sprayable resinous compositions, such as epoxy compounds, can be used to completely form a light tight seal for selenium diodes.

Conforming Matrix Corp., Dept. PVP, Toledo Factories Bldg., Toledo 2, Ohio.

THICKNESS TESTERS

Two portable thickness testers, Audigage Model 5 and Model 6, are detailed in eight-page Bulletin A-200 available from Branson Instruments, Inc. These ultrasonic gages permit measurement of thickness from only one side of a wide variety of materials—metal, glass, plastic—by relating a variation in thickness to the change in resonant frequency.

Product will detect laminar flaws, and check for corrosion loss. It is often used on pressure vessels, piping, storage tanks, boiler tubes, ship hulls and bulkheads, hollow forgings, extrusions, castings, as well as large plates and heets.

The Audigage Model 6 features a direct reading system, which registers the frequency difference between resonance indications on a panel meter calibrated in thickness. A switch automatically compensates for differences in materials.

Bulletin A-200 includes complete specifications and suggested applications for both models.

Branson Instruments, Inc., Dept. PVP, 40 Brown House Rd., Stamford, Conn.

SILICONES

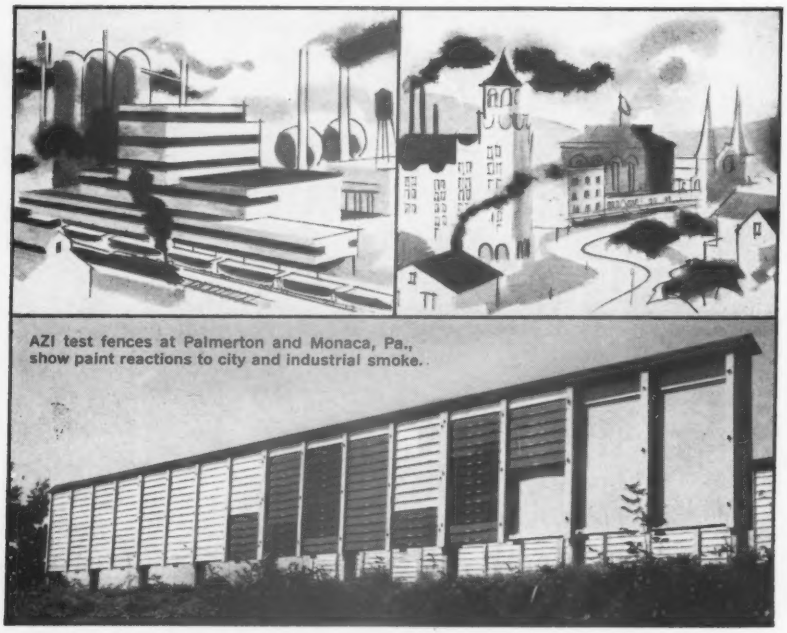
A 1960 guide to the complete line of silicone products is now available in an eight-page illustrated bulletin.

Listing major product uses and benefits, this publication features silicones for: antifoam and release agents, lubricants, paper release, cosmetics and polishes, masonry water repellents, paint and paint additives, textile finishes, and electrical insulation. Another section is devoted to silicone rubber, including liquid RTV (room temperature vulcanizing) silicone rubber compounds. The guide also contains information for obtaining additional detailed information on specific silicone products.

General Electric Co., Silicone Products Dept., Dept. PVP, Waterford, N. Y.

New tests in Pennsylvania measure paint reactions to

INDUSTRIAL *and* **CITY SMOKE**



AZI test fences at Palmerton and Monaca, Pa., show paint reactions to city and industrial smoke.

Research by AZI helps you improve paint formulations

Additional fences have been set up near heavy industrial areas in Pennsylvania as part of AZI's nation-wide study of paints. This study will show how paints react to the deteriorating effects of sun, smoke, dirt, and soot. They will show the levels of zinc oxide that best improve paint durability, tint retention, non-chalking action, and resistance to mildew.

Improvements like these in paint quality often result in greater sales—and profits; yet added levels of ZnO provide these improvements at only a fractional part of the total cost of the paint.

If you would like to be informed of the progress and results of all tests in the study, write: American Zinc Institute, 60 East 42nd Street, New York 17, N. Y.

AZI **AMERICAN ZINC INSTITUTE, INC.**

60 East 42nd Street, New York 17, N. Y.

FILLERS

New two-page sheet entitled *Facts on Filteraids and Fillers* describes diatomite and perlite fillers and filteraids, the use of diatomite as insulation and diatomite-asbestos and carbon-based filteraids. A graphic table permits quick and ready comparison of the various types in terms of specific gravity, particle size, color, moisture absorption and other factors.

Shown in chart form are the flowrate characteristics of eight standard grades of diatomite, one of perlite and one of carbon. In another chart, the sizes of particles removed from a liquid by five grades of diatomite filteraid are indicated. Characteristics are shown for diatomite in both its uncalcined form and its calcined and process-calcined forms. Special-process perlite characteristics are indicated, as well as characteristics for carbon-based fillers.

Dicalite Dept., Great Lakes Carbon Corp., Dept. PVP, 612 So. Flower St., Los Angeles 17, Calif.

KETONES

New 48-page booklet describes ketones as solvents and chemical intermediates.

The booklet has up-dated on fifteen ketones and diketones that are available in commercial quantities from the firm. It includes information on applications, coatings, formulations, physical properties, solvent properties, constant-boiling mixtures, shipping, storage, handling, physiological properties, specification limits, and test methods. A comprehensive bibliography on ketones and their uses is a feature of the new publication.

Ketones are widely used by the surface coatings industry as solvents for nitrocellulose and other cellulose esters, vinyl-chloride-acetate, and other resins both synthetic and natural. They are also used as dewaxing agents for lubricating oils, as solvents for pharmaceuticals, and as intermediates for the synthesis of dyes, surfactants, pharmaceuticals, lubricating oil additives, resins, and rubber chemicals.

Union Carbide Chemicals Co., Division of Union Carbide Corp., Dept. PVP, 30 East 42nd St., New York 17, N. Y.

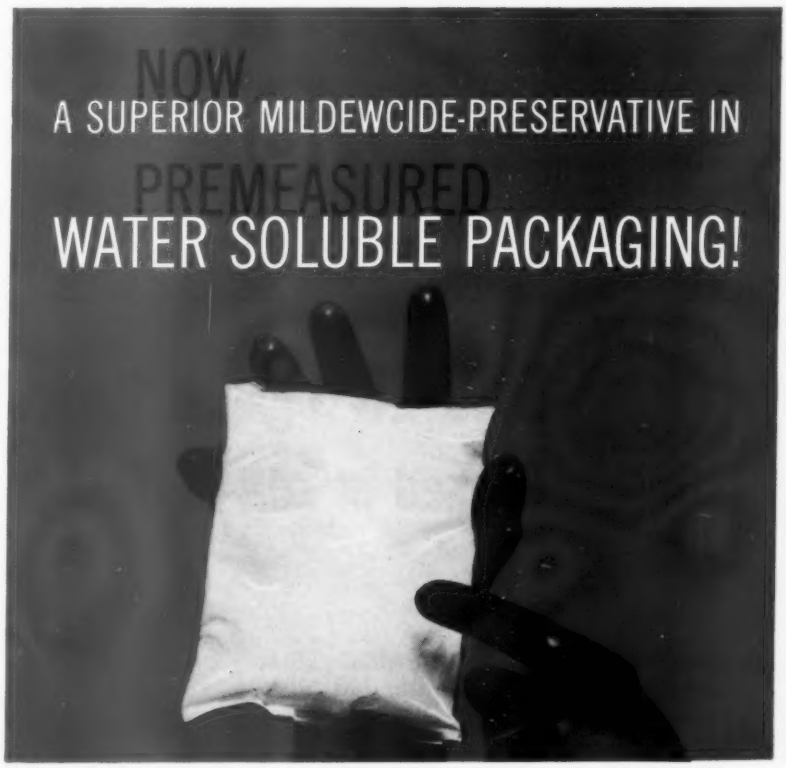
MATERIAL CUTTER

New eight-page, two-color illustrated folder describes various features of the "Porter-Blum" Ultra-Microtome.

The text points out that the "Porter-Blum" cuts sections to as thin as 1/40 micron (250 angstroms), which operates successfully on biological materials, bone, hair, teeth, rubber, natural and synthetic fibers and soft materials. The Servall Diamond Knife for the sectioning of harder materials as well as other Servall accessories are included in the new literature.

Micrographs of tissue sections demonstrate how electron-microscope investigation is aided by the "Porter-Blum's" ability to produce highly-uniform serial sections that permit graduate observation of a given area. Also alternate thin and thick sections may be cut for electron-and light-microscope comparisons. Enlargements of the mechanical features of the Ultra-Microtome clearly show the operational simplicity and versatility of the instrument. This folder also mentions the availability of "Thin Sectioning & Associated Technics for Electron Microscopy", an eight-page illustrated book published recently at $2.00 per copy by the Norwalk Co.

Ivan Sorvall, Inc., Dept. PVP, Norwalk, Conn.



METASOL 57®

is the paint industry's most effective and dependable mildewcide-preservative for aqueous and oleoresinous systems. Its use has been recommended by leading raw material manufacturers, and it has been incorporated into formulations of major paint manufacturers. Now—in this revolutionary new packaging, METASOL 57 offers extra dividends in safety, convenience and economy for aqueous systems. These pre-measured dosages can be added directly to the formulation without opening. There's no weighing or measuring—no waste—fewer hazards—no guess work. Convenient 4 oz., 8 oz., and 16 oz., packages meet every need and every requirement.

For full information write us direct or call your nearby METASOL® agent.

METASOL DIVISION METALSALTS CORPORATION
200 WAGARAW RD. HAWTHORNE, N.J.

STEEL SHEETS

The most effective techniques for painting galvanized steel sheets, based on years of research and experience, are explained in a new booklet just released by the Committee on Galvanized Steel Sheet Research of American Iron and Steel Institute.

Titled *Painting Galvanized Steel*, the booklet was produced jointly by the Committee, the American Zinc Institute, and the National Paint, Varnish and Lacquer Assn.

Although galvanized steel sheets are usually used without any additional finishing, because of the attractive, corrosion-resistant zinc coating, the committee said that the booklet was prepared because of the many requests for information from users desiring to paint the sheets.

According to the booklet, galvanized steel sheets may be painted for reasons of appearance, to increase heat reflection, or to extend the period of protection provided by the zinc coating.

It notes that where color matching may be desired on roofing, siding, gutters or signs, any good exterior paint or enamel may be applied over a prime coat formulated for use on galvanized steel.

Committee on Galvanized Steel Sheet Research, American Iron and Steel Institute, Dept. PVP, 150 East 42nd St., New York 17, N. Y.

PUMPS

New 8-page, 2-color bulletin gives design features and model specifications of sealless "canned" pumps for leak-proof pumping of corrosive, toxic, explosive, radioactive and other problem fluids.

Chempump Div., Fostoria Corp., Dept. PVP, P. O. Box 35-27, Huntingdon Valley, Pa.

PROTECTIVE COATINGS

New 16-page industrial catalog covers protective coatings, galv-a-grip, colored aluminum, and special chemical resistant and hi-heat rust inhibitive coatings. A special feature of the catalog is a helpful Selector Guide to aid in correctly determining the most effective and economical uses of protective coatings. The Selector Guide evaluates the technical properties of various coatings and enables the reader to determine the most suitable product for a wide variety of industrial uses. Another feature is the inclusion of two pages of actual paint chips to facilitate color matching. Many types of rust preventive applications in the industrial field are covered in complete detail so the catalog performs as a basic reference piece to architects, contractors, maintenance men, industrial painting firms and consulting engineers. Many four-color illustrations are included.

Master Bronze Powder Co., Dept. PVP, 538 W. State St., Calumet City, Ill.

ELECTRIC HEATERS

A technical bulletin describing features of electric heaters, designed for the transfer of heat by circulating thermal liquids has been issued. This bulletin contains a complete description of the advantages of electric heat transfer systems and contains a phantom illustration of a typical package unit. Also illustrated is a unit flow schematic.

Gerin Manufacturing Co., Dept. PVP, 683 North Fifth St., Newark 7, N. J.

Increasingly Popular...

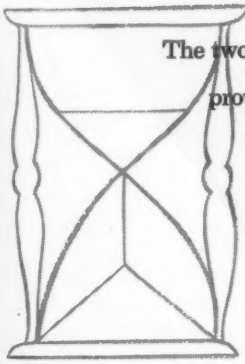
DAVIES 5 gallon Square Cans Packed in 200-lb. Test Cartons

These Davies cans, packed in colorful cartons, have sales appeal and are widely used by the Paint, Oil, and Chemical industries. In addition to product protection and economy, this package helps to sell the product. The square, compact shape saves on storage and shipping space. The cans are also furnished without cartons and may be plain or lithographed. Available with all popular pouring spouts and backed by Davies' top quality and reliable service.

THE DAVIES CAN CO. 8007 Grand Avenue • Cleveland 4, Ohio

Your best defense against the elements

New FR* Chrome Yellows



The two new chrome yellows
provide outstanding resistance
to darkening on exterior exposure

FAST PRIMROSE FR 2100
FAST LEMON FR 2101

Ask our representative for Bulletin No. 43

*FADE RESISTANT

Kentucky Color
AND CHEMICAL COMPANY

KENTUCKY COLOR & CHEMICAL DIVISION
OF THE HARSHAW CHEMICAL COMPANY,
LOUISVILLE, KENTUCKY

Kentucky Color & Chemical Division of the
Harshaw Chemical Company
600 North 34th Street
Louisville, Kentucky

Please send me at once the following: Bulletin No. 43 ☐
Samples: FR-2100 ☐ FR-2101 ☐

Company Name _____

Address _____

City _____ Zone ____ State ____

Your Name _____

a truly complete service
...from the oldest and leading custom-loaders
of aerosol specialties

Sprayon has handled the greatest possible variety of contract-loading assignments for many of the nation's largest manufacturers. This experience, plus Sprayon's outstanding engineering and production facilities, is your best means to a commercially successful aerosol package. Problem product or routine product, get Sprayon's dollars-and-cents answer to your next loading job.

Sprayon
PRIVATE LABEL AEROSOLS

SPRAYON PRODUCTS, INC. • 2084 EAST 65 STREET • CLEVELAND 3, OHIO

AEROSOL COATINGS

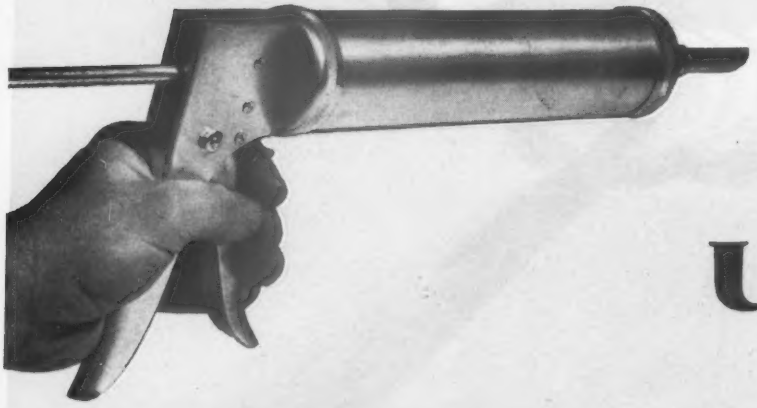
PACKAGING

FORMULATION

PRODUCTION

This 12-ounce aerosol spray is said to produce a smooth, dark, and non-glare coating that dries instantly and will not rub off. Manufactured by the Industrial Supply Division of Sprayon Products, Inc., of Cleveland, this product, because of its smooth properties, is well adapted to the fine lines of high-precision work.

for IMPROVED STABILITY in Caulking Compounds



Use Special T-Blown Soybean Oil

SPECIAL T-BLOWN SOYBEAN OIL is recommended for quality caulking compounds. It provides all the excellent wetting and working properties of a quality blown soybean oil with excellent package stability.

For further information on SPECIAL T-BLOWN SOYBEAN OIL and other Spencer Kellogg blown soybean oils, contact your nearest Spencer Kellogg representative or write to the Technical Service Department in Buffalo.

SPENCER KELLOGG AND SONS, INC.

BUFFALO 5, N. Y.

SPENCER SK KELLOGG

PAINT AEROSOLS and PUBLIC REGULATIONS

By
E. G. Roberts

WITH the trend towards larger size containers for paint aerosols as well as extended use of propellent and solvent systems with flammable properties, a review of various regulations which govern the packaging, shipping and labeling of aerosols is desirable.

Such regulations restrict the size and performance of containers as well as provide flammability limits for the products contained therein. Of major importance, actually the "bible," are the U. S. Interstate Commerce Commission regulations as contained in "Freight Tariff No. 10 publishing Interstate Commerce Commission Regulations for Transportation of Explosives and Other Dangerous Articles by Land and Water in Rail Freight Service and by Motor Vehicle (Highway) and Water including Specifications for Shipping Containers". These affect both interstate as well as intrastate shipment.

The ICC recognizes the services of the Bureau of Explosives, Association of American Railroads in conferring with industry and preparing regulations which are reasonable and safe. The Bureau of Explosives maintains a laboratory for the testing of all articles governed by Tariff 10. The services and guidance of the Bureau of Explosives has been of infinite value in the development and growth of the aerosol industry.

Aerosols are technically classified as "Dangerous Article" since they are packaged with "Compressed Gases". Also listed are "Flammable Gases" and "Liquidfied Hydrocarbon Gases". For those who wonder as to the spelling, also listed are "Inflammable Liquids" with the notation to see "Flammable Liquids".

Flammable Liquids are defined [Sec. 73.115(a)]:

> "A flammable liquid for the purpose of Parts 71-78 is any liquid which gives off flammable vapors (as determined by flash point from Tagliabue's open-cup tester, as used for test of burning oils) at or below a temperature of 80°F."

Section 73.118(a) exempts from specification packing flammable liquids except those which are corrosive or oxidizing which are in metal containers of not over one quart capacity.

At this point the reader should be warned that excerpts of parts of any laws such as Tariff 10 should be for general orientation only. Determination of the classification of a particular product should be made only with the full text of the Regulations before you. More often than not an "expert" in this area is necessary for guidance

Illinois Bronze Powder Company of Chicago uses hot water bath employing,magnetic unit for checking leaks in paint-filled aerosol cans prior to shipping.

through its many sections and subparagraph. For final decision consultation with the Bureau of Explosives in New York may be desirable.

A compressed gas is defined (Sec. 73.300):

"A compressed gas for the purposes of Parts 71-78 is defined as any material or mixture having in the container either an absolute pressure exceeding 40 pounds per square inch at 70°F., or an absolute pressure exceeding 104 pounds per square inch at 130°F., or both; or any liquid flammable material having a Reid vapor pressure exceeding 40 pounds per square inch absolute at 100°F."

It should be noted that absolute pressure used throughout the Regulations are approximately 15 pounds higher than effective or guage pressure, at sea level.

A compressed gas is defined as flammable [Sec. 73.300(b)] if any one of the following occurs:

"(1) Using the Bureau of Explosives' Flame Projection Apparatus, the flame projects more than 18 inches beyond the ignition source with the valve opened fully, or the flame flashes back and burns at the valve with any degree of valve opening."

"(2) Using the Bureau of Explosives' Open Drum Apparatus there is any significant propagation of flame away from the ignition source."

"(3) Using the Bureau of Explosives' Closed Drum Apparatus, there is any explosive of the vapor mixture in the drum."

The "valve" referred to in the above section is that on the aerosol container.

That part of the regulations under which most aerosols including paints are now classified as being exempt from specification packaging, labeling and marking requirements is Sec. [73.302(3):]

"Inside nonrefillable metal containers charged with a solution of materials and compressed gas or gases of capacity not exceeding 32 cubic inches (approx. 18 fl. oz.). Contents of the container must be nonpoisonous and if flammable as provided in Sec. 73.300(b)(2),(3), and (4), the flash point, as determined by Bureau of Explosives' Methods, must not be less than 20 deg. F. Pressure in the container must not exceed 75 pounds per square inch absolute at 70 deg. F. and the liquid content of the material and gas must not completely fill the container at 130 deg. F. However, if the pressure exceeds 55 pounds per square inch absolute at 70 deg. F., a spe-

CSMA FLAMMABILITY and COMBUSTIBILITY TESTS

Flame Projection Test

Equipment. The test equipment consists of a base 4 inches wide and 2 feet long marked in 6 inch intervals. A rule 2 feet long and marked in inches is supported horizontally on the side of the base and about 6 inches above it. A plumber's candle of such height that the top third of the flame is the height of the horizontal rule is placed at the zero point in the base.

Procedure. The test is conducted in a draft-free area that can be ventilated and the atmosphere cleared between each test. The self-pressurized container is placed at a distance of 6 inches from the ignition source and the spray jetted into the top third of the flame with valve opened fully for periods of 15-20 seconds. The length of the flame projection from the source is read on the horizontal scale. Three readings are taken on each sample and the average of the three is taken as the result.

Drum Tests

Equipment. The equipment consists of a 55-gallon open-head steel drum or similar container which is placed on its side and fitted with a hinged cover over the open end that will open readily at a pressure of 5 p.s.i. The closed or solid end is equipped with three shuttered openings (top, side and base of solid end) for introduction of the spray. These openings are approximately two inches from edge of drum head and are one inch in diameter. The side opening (2 inches from edge) is at the mid point between the top edge and bottom edge of the drum head. There is safety glass or plastic window 6 inches square in the center of the solid end. A lighted plumber's candle is placed inside the drum on the lower side and midway between the ends.

Procedure. The tests are conducted in the open and when temperature is between 60 degrees and 80 degrees F.

Open Drum Test

This test is conducted with hinged end in a completely open position and with all three shutters closed. The spray from the dispenser, with valve opened fully, is directed into the upper half of the open end and above the ignition source for one minute. Any significant propagation of flame through the vapor-air mixture away from the ignition source shall be considered a positive result—but—any minor and unsustained burning in the immediate area of the ignition source shall not be considered a positive result.

Closed Drum Test

This test is conducted with the hinged cover dropped into position to rest freely against the end and to close the open end of the drum to make a reasonable secure but no necessarily a completely air-tight seal. The top shutter only is opened and the spray is jetted into the drum through this shutter with valve fully opened for one minute. After clearing the atmosphere in the drum, the jetting is repeated similarly through the side and bottom shutter in turn and in each case with the other two shutters closed. Any explosion or rapid burning of the vapor-air mixture sufficient to cause the hinged cover to move is considered a positive result.

cification 2P container must be used. Each completed container filled for shipment must have been heated until content reached a minimum temperature of 130 deg. F. without evidence of leakage, distortion, or other defect".

As a matter of explanation it should be understood that where a "specification" container is required certain material specifications and container performances must be complied with. Also special cartons materials and markings are usually required. At present the only specification container (2P) of interest to the aerosol industry is the seamless drawn steel container available only from one can manufacturer in 6 and 12 ounce sizes.

The regulations also provides complete exemptions for all containers, including glass, of not over 4 fl. oz. capacity. Since "purse size" aerosol paints are not likely ever to be of commercial use this provision is of academic interest only.

Since the above quoted section permits aerosols with a flash above 20 deg. F. even if flammable by the Drum and Flame Projection tests these latter would appear to be meaningless from the industrys' viewpoint. However, the permissable limits of not less than 20 deg. F. on the flash point have recently been added and the Drum and Flame tests are still used by the aerosol industry in evaluating the flammability of their products.

The best known, widely used, and most spectacular, is the Flame Projection test. This test is conducted by placing the aerosol container at a distance of 6 inches from the ignition source, usually a candle, and the spray jetted into the top third of the flame with the valve fully open for 15-20 seconds. The length of flame projection from the source is read "on the horizontal scale". The 18 inch projection is indicated as the upper limit for flammability and the flame should not "flash back", that is extend back to the valve source. If this occurs the industry usually refers to it as the "blowtorch" effect.

It is the "flash-back" which has caused the most controversy in the aerosol industry. Even though the ICC does not prohibit the shipment of aerosols with such a flash back, many packers marketers prefer not to package such products.

Pertinent to the problem is the understanding that the ICC and the Bureau of Explosives are only interested in the shipment of aerosols and the hazards therein and have no jurisdiction over their safety in the hands of the consumer. In the growth of our industry there have been some members who feel that the ICC should hold an "umbrella" over the industry and have the regulations give consumer protection. However the Bureau of Explosives while *not* indicating that aerosols as now packaged and shipped are consumer hazards when properly used clearly takes the position that its only concern is safety in transportation.

The Chemical Specialties Manufacturers Association, the trade organization of the aerosol industry, has always been conscious of consumer safety. The excellent record of the industry and its low

IMPROVE PRODUCT PERSONALITY
with Odor Control

The discreet suggestion of a pleasant odor can effect a marked improvement in the sales acceptance of your product. Through the modern techniques of scientific odor control, scent becomes an important plus factor in sales appeal and brand loyalty for your product.

The research and development laboratories of van Ameringen-Haebler will evaluate your product from the point of view of scent and suggest an aromatic additive to improve its personality.

van Ameringen-Haebler *division of*
INTERNATIONAL FLAVORS & FRAGRANCES INC.
521 West 57th Street • New York 19, New York
Leading creators and manufacturers in the world of fragrance

ARGENTINA AUSTRIA BELGIUM BRAZIL CANADA ENGLAND FRANCE GERMANY
HOLLAND INDONESIA ITALY NORWAY SOUTH AFRICA SWEDEN SWITZERLAND

Courtesy of Consolidated Aerosols—Photo by Fenten
For consumer safety, ICC regulations insist that explicit directions on the proper use of aerosol paints appear on the label.

product liability rate attest to its concern and efforts. With the trend in the aerosol industry towards lower costs in the use of liquified petroleum hydrocarbons which in themselves are more flammable than the fluorinated hydrocarbons, the CSMA has set up a scientific group to evaluate the problem. The objective of this committee is to evaluate existing regulations and flammability tests and to recommend additional procedures if necessary as guides in protecting the public in the use of aerosols. The findings of this group will have a profound effect on the trends in the formulation of aerosols including paints and coatings.

Relative to larger size containers now on the horizon, 24 oz. tinplate and quart size aluminum containers, the issue is rather clearly indicated. At present the largest size "low pressure" non-refillable containers permitted are those of 18 fl. oz. capacity.

There has been a limited availability of drawn seamless containers of larger capacity. These are of thick wall, usually welded construction which do not lend themselves to decorative labeling so necessary for mass distribution. Their costs are high compared to can standards. Such containers have been permitted under ICC regulations [Sec. 73.302(2)[which permit metal construction of not over one quart capacity and requires that each container be tested before shipment to three times the filling pressure at 70 deg. F. and if refilled and reshipped be retested. Charging to not over 170 pounds per square inch is at 70 deg. F. is permitted.

During and right after World War II the "high pressure insect bombs" were produced under ICC specifications 9,40 or 41. These likewise are heavy walled containers, many requiring safety release devices.

It is fortunate that the aerosol industry has for its guidance the Bureau of Explosives which recognizes that for its continued growth, modifications of ICC regulations may be necessary and can be accomplished as long as the basic principles of shipping safety are adhered to. The Bureau of Explosives have indicated that if container manufacturers can produce 24 and 32 oz. cans with structural characteristics and pressure performances equivalent to presently approved containers, shipment may be permitted on a temporary basis. To obtain such a temporary permit for six months, test data and samples are usually required. If the shipping record is satisfactory the facts and suggested ICC regulations amendments are submitted to the CSMA and Compressed Gas Association. If general industry approval is forthcoming a docket is prepared for submission to the ICC and subsequent public hearing. The Bureau of Explosives rarely, if ever, has a petition rejected.

Other government agencies, federal and state now generally recognize the ICC regulations on aerosols. In the early days of the industry the U. S. Post Office offered problems in the shipment of aerosols through the mail. Now their mailing requirements are similiar to ICC regulations.

The CSMA through its Precautionary Labeling Committee is making every effort to have proposed Federal Hazardous Substances Labeling legislation satisfactory to industry including aerosols.

Many city regulations of which New York is an example is of special consideration. New York City provides exemption for regular paint products from the requirement of a Certificate of Approval. However this exemption does not apply to any paint product that is "packaged in aerosol (pressurized) containers." The city in requiring flammability tests on aerosol paints does not recognize the ICC test methods but utilizes the Modified Open Cup method.

Most states as Connecticut which have recently enacted laws covering the labeling of "hazardous substances" have kept their requirements similar to the ICC.

One of the unsolved problems of the aerosol industry is that the use of adequate labeling of aerosol products for distribution in New York City or other special problem areas may hinder sales in other areas which do not require "warning" labeling. Often one label is required for New York City and another for elsewhere.

Air shipment of hazardous substances also presents special problems. In general their regulations have not provided undue restraint on shipment of aerosol paints. However these regulations are quite involved and may differ from airline to airline. For details, Tariff 6B of the Air Transport Board, CAB should be consulted. Abstracts of these regulations plus those of the ICC and other agencies are found in the CSMA "Agencies & Regulations of Interest to the Aerosol Industry".

From a review of existing public regulation it is apparent that they do not preclude the trend toward larger containers or the use of petroleum hydrocarbons. Future expansion of the industry will be particularly affected by the availability of 24 or 32 oz. cans for paints. The answer to their availability rests with new developments by the container manufacturers, the old line can companies as well as companies making aluminum containers.

•

Plasti-Kote to Expand

Plasti-Kote, Inc., aerosol paint manufacturers, will expand sales and distribution of its push button aerosol paint products in Europe.

Elias Shapiro, Vice President in charge of sales for Plasti-Kote, recently returned from a six-week tour of major European countries. "Europe has just discovered paint in spray form. We feel there is a tremendous opportunity here and we are going after it", he said.

The contract packager had the answer ... *another success story from the ISOTRON® file.*

J. Myron Kimmel (left), president of Aeropak, discusses formula changes required for aerosol packaging with the marketer.

He packed PLUS PROFITS in a Push-Button Can

The paint marketer*—like many manufacturers—wanted to exploit the vast do-it-yourself market for aerosol-packaged products, but needed help. He went to a leading contract packager, Aeropak, Inc., of Chicago, and quickly got the technical aid he required. Now, thanks to Aeropak and the push-button can, the marketer has a new and highly profitable product . . . and milady paints with the skill of a "pro". To extend such services to marketers throughout the country, Aeropak recently acquired a new plant in Kearny, N. J.

If you have a candidate for the rich aerosol market, it will pay you to take advantage of the many services offered by the contract packager. He's a specialist in solving difficult problems; can help reformulate your product for aerosol use, recommend the best can, valve and propellent. An increasing number of packagers rely on Pennsalt ISOTRON® propellents to help turn "also ran" products into best sellers on the aerosol market.

**name on request*

ISOTRON—*The Key To Modern Living*

Pennsalt® Chemicals
ESTABLISHED 1850

Isotron Department 303
PENNSALT CHEMICALS CORPORATION
Three Penn Center
Philadelphia 2, Pa.

Effect of Fluorocarbon Propellents and Methylene Chloride on Various Plastics

By
James A. Brown*

THE use of plastics as valve components for aerosol containers has led to many questions concerning the effect, if any, upon these plastics of various propellents. As the use of plastics for aerosol containers increases, the need for data concerning these effects will become more pressing.

*General Chemical Div., Allied Chemical Corp. Edgewater, N. J.

This paper was presented at the Aerosol Div., Chemical Specialties Manufacturers Association Annual Meeting, December 7-9, 1959 in Washington, D. C.

In this study, an attempt was made to determine some physical changes that occur to various plastics after contact with fluorinated hydrocarbons for prolonged periods of time. The physical changes of particular interest were dimension and weight changes. Physical changes involving strength or electrical characteristics are outside the scope of this work.

The plastics that were selected are representative of different types of polymers. The samples upon which these tests were made were, for the most part, purchased through normal commercial channels. For this reason, little information was available concerning the amounts and types of plasticizers or fillers used in the manufacture. The fluorinated hydrocarbons that were used as solvents for these tests were propellents 11, 12, 21, 112, 113 and 114a. Tests were also run using methylene chloride so that comparisons could be made with a representative chlorinated hydrocarbon.

The method used to determine

TABLE I

Swelling Characteristics of Various Plastics in Propellent II

Plastic	% Change width	% Change length	% Change thickness	% Change weight	Remarks
Cellulose nitrate	0.5	0.6	0.8	5.2	After 2 weeks, final weight 98% of original weight
Polyvinyl alcohol	0.7	0.3	0.8	0.4	Solvent has little effect
Polyvinyl chloride	0.2	0.0	0.7	11.5	After 2 weeks, final weight 110% of original weight
Teflon (tetrafluoroethylene)	0.0	0.0	1.5	1.4	After 2 weeks, wt. 100.5% of original and thickness 101.5% of original wt.
Cellulose acetate	0.0	0.4	0.0	4.9	After 2 weeks, final weight 98.5% of original weight
Polyethylene	6.1	6.7	7.6	32.4	After 2 weeks, dimensions normal. Wt. 101% of original weight
Genetron VK	2.4	0.8	15.0	11.6	After 2 weeks, weight and dimensions stayed the same
Bakelite (phenolic)	0.0	0.0	0.0	0.0	Solvent has no effect
Zytel 101 (nylon 66)	0.0	0.0	0.0	0.0	Solvent has no effect
Plexiglas (methyl methacrylate)	0.0	0.0	0.0	0.0	Solvent has no effect
Polystyrene	—	—	—	—	Sample completely disintegrated
Saran (polyvinylidene chloride)	−0.3	−0.2	0.0	0.2	Solvent has little effect
Plaskon 8200 (nylon 6)	0.0	0.0	0.0	0.0	Solvent has no effect

TABLE II

Swelling Characteristics of Various Plastics in a Mixture of 90 Per Cent Propellent 112/112a and 10 Per Cent Heptane

Plastic	% Change width	% Change length	% Change thickness	% Change weight	Remarks
Cellulose nitrate	−0.3	−0.2	−0.8	1.7	After 2 weeks, final weight 99.9% of original weight
Polyvinyl alcohol	−2.2	0.0	−0.8	0.1	After 2 weeks, final width 99.5% of original width
Polyvinyl chloride	0.0	0.0	0.0	0.0	Solvent has no effect
Teflon (tetrafluoroethylene)	0.0	0.0	0.0	0.2	Solvent has little effect
Cellulose acetate	−0.1	0.1	0.0	1.4	After 2 weeks, weight returned to normal
Polyethylene	5.0	5.2	5.1	25.2	After 2 weeks, weight 104% of original weight
Genetron VK	0.6	0.0	3.4	3.5	After 2 weeks, weight 102.5% of original and width 102.5% of original
Bakelite (phenolic)	−0.7	−0.1	0.0	0.0	Solvent has little effect
Zytel 101 (nylon 66)	0.0	0.1	0.0	0.0	Solvent has no effect
Plexiglas (methyl methacrylate)	0.0	0.1	0.9	0.0	Solvent has little effect
Polystyrene	—	—	—	—	Sample completely disintegrated
Saran (polyvinylidene chloride)	−0.3	−0.2	−1.7	0.0	After 2 weeks thickness returned to original dimension
Plaskon 8200 (nylon 6)	0.0	0.0	0.0	0.4	Solvent has little effect

TABLE III

Swelling Characteristics of Various Plastics in Propellent 113

Plastic	% Change width	% Change length	% Change thickness	% Change weight	Remarks
Cellulose nitrate	−0.4	0.0	0.0	1.7	After 2 weeks, final weight 99.5% of original weight
Polyvinyl alcohol	0.0	−0.1	0.8	0.0	Solvent has little effect
Polyvinyl chloride	0.6	0.0	0.8	0.0	Solvent has little effect
Teflon (tetrafluoroethylene)	−0.6	0.0	1.5	1.2	After 2 weeks, final weight 100.5% of original weight
Cellulose acetate	0.0	0.0	0.8	1.6	After 2 weeks, final weight 99.7% of original weight
Polyethylene	2.6	2.3	3.4	12.1	After 2 weeks, final weight 101% of original weight
Genetron VK	1.6	0.6	19.5	16.5	After 2 weeks, final weight 109% of original and thickness 112% of original
Bakelite (phenolic)	−0.3	−0.2	0.0	0.0	Solvent has little effect
Zytel 101 (nylon 66)	−0.1	0.0	−0.8	0.0	Solvent has little effect
Plexiglas (methyl methacrylate)	0.0	−0.2	0.0	0.0	Solvent has little effect
Polystyrene	0.0	−0.2	0.0	0.0	Solvent has little effect
Saran (polyvinylidene chloride)	−0.1	−0.1	−0.8	0.0	Solvent has little effect
Plaskon 8200 (nylon 6)	0.0	0.0	0.0	0.0	Solvent has no effect

the swelling characteristics of these plastics was essentially that of ASTM method D543-52T. Two slight modifications to this procedure were found to be necessary. Test strips of the various plastics were prepared having the following dimensions: 7/8 X 3 7/16 X 1/8 in. The ASTM procedure suggests 3 X 1 in. strips. The dimensions of the samples were modified so that they could be accommodated by standard Fischer Porter aerosol compatibility tubes. The strip length was then increased to maintain the 7 sq. in. of surface area specified by ASTM. The other modification involved the preconditioning of the sample strips. Facilities for maintaining constant humidity conditions for the 48-hour period prior to actual test were not available. However, during this interval the samples were at a temperature of approximately 25C and exposed to 30-50 per cent relative humidity.

The plastic test strips were measured and weighed prior to and immediately following the immersion period. The dimensional measurements were made to the nearest mil, using an Ames 0-4 micrometer. This instrument has divisions of 0.001 in. Weighings of the sample were made on a standard laboratory analytical balance with an accuracy of approximately 0.2 mg. After initial measurements had been noted, the plastic test pieces were placed in small cylindrical jars measuring approximate-

TABLE IV

Swelling Characteristics of Various Plastics in Propellent 21

Plastic	% Change width	% Change length	% Change thickness	% Change weight	Remarks
Cellulose nitrate	—	—	—	—	Sample completely disintegrated
Polyvinyl alcohol	10.5	12.9	13.0	48.1	After 3 weeks, wt. still 105% of original and dimension approx. 102% of orig.
Polyvinyl chloride	7.2	15.1	30.6	63.3	After 3 weeks, wt. and dimensions still 110% of orig. values
Teflon (tetrafluoroethylene)	0.0	0.1	0.7	1.5	Regained orig. wt. within 2 weeks
Cellulose acetate	—	—	—	—	Sample completely disintegrated
Polyethylene	4.6	4.5	2.5	19.5	Sample showed slight decrease from orig wt. and dimension after 2 wks.
Genetron VK	8.1	7.1	12.5	19.5	After 3 weeks, still 103% of orig. wt.
Bakelite (phenolic)	0.0	0.0	0.0	0.0	Solvent has no effect
Zytel 101 (nylon 66)	0.0	0.0	0.0	0.6	Solvent has little effect
Plexiglas (methyl methacrylate)	—	—	—	—	Sample completely disintegrated
Polystyrene	—	—	—	—	Sample completely disintegrated
Saran (polyvinylidene chloride)	1.3	1.0	4.2	5.3	After 2 weeks, thickness and weight still 101% of original values
Plaskon 8200 (nylon 6)	0.8	0.1	2.2	4.0	After 2 weeks, wt 102% of orig. and thickness 101% of original

TABLE V

Swelling Characteristics of Various Plastics in Propellent 114a

Plastic	% Change width	% Change length	% Change thickness	% Change weight	Remarks
Cellulose nitrate	0.0	−0.1	0.0	0.3	Solvent has little effect
Polyvinyl alcohol	0.1	0.2	0.8	0.1	Solvent has little effect
Polyviny chloride	0.1	0.1	−0.8	0.0	Solvent has little effect
Teflon (tetrafluoroethylene)	0.2	−0.3	4.3	3.8	After 2 weeks, weight and thickness still 102% of original values
Cellulose acetate	−0.2	−0.1	−0.8	0.2	Solvent has little effect
Polyethylene	0.2	0.6	0.0	4.0	After 2 weeks, weight still 101% of original weight
Genetron VK	−0.2	0.0	3.2	3.6	After 2 weeks, weight and thickness still 102% of original values
Bakelite (phenolic)	−0.1	−0.2	−0.8	0.0	Solvent has little effect
Zytel 101 (nylon 66)	−0.1	−0.2	0.0	0.4	Solvent has little effect
Plexiglas (methyl methacrylate)	−0.4	−0.2	−0.9	0.0	Solvent has little effect
Polystyrene	0.7	−0.2	−0.8	0.0	Solvent has little effect
Saran (polyvinylidene chloride)	0.0	0.0	−0.8	0.0	Solvent has no effect
Plaskon 8200 (nylon 6)	0.1	−0.1	0.0	0.0	Solvent has no effect

ly 5 in. in length and 1 in. in diameter. The appropriate propellent was then added and the bottle capped. Propellents having a vapor pressure in excess of 1 atmosphere at ambient temperature were run in 3-oz. Fischer Porter Pyrex compatibility tubes equipped with a standard aerosol valve. The bottles and tubes were then stored for a period of 7 days at 23-25C.

At the end of this time the samples were taken out of the solvent, wiped dry with a clean cloth, and immediately weighed and measured. After approximately two weeks, additional measurements were made on those samples which showed changes in excess of 1 per cent of the original values. This made it possible to determine whether certain plastics exhibited a permanent deformation or weight change.

The results of these tests in terms of the percentage change in weight and dimensions will be found in Tables I—VII.

In general, it was observed that Bakelite, Nylon 6, Nylon 66, Saran and Teflon were only slightly affected by all of these solvents. With the exception of propellent 114a, polyethylene showed a weight gain in excess of 10 per cent after immersion in all the solvents. Polystyrene broke down completely in all but the solvents containing the most fluorine in the molecule. The vinyl compounds were attacked considerably by the solvents containing hydrogen in the molecule.

In order to obtain some general ideas as to the effects of various atomic constituents of the molecule, a summation was made of all the percentage changes found for each solvent. If a sample completely broke down, the percentage change was taken to be 100. This gave us a rather arbitrary but indicative measure of the relative solvent power of each propellent,

TABLE VI

Swelling Characteristics of Various Plastics in Propellent 12

Plastic	% Change width	% Change length	% Change thickness	% Change weight	Remarks
Cellulose nitrate	0.0	0.0	0.0	1.5	After 2 weeks, weight back to original value
Polyvinyl alcohol	−0.3	−0.7	0.0	0.4	Solvent has little effect
Polyvinyl chloride	0.0	0.0	0.0	0.0	Solvent has no effect
Teflon (tetrafluoroethylene)	−0.4	−0.7	9.6	6.7	After 2 weeks, wt. still 103% of original value thickness back to normal
Cellulose acetate	−0.3	0.0	−0.8	15.4	After 2 weeks, weight still 112.5% of original value
Polyethylene	1.9	0.4	2.5	12.5	After 2 weeks, thickness and weight back to original values
Genetron VK	2.7	1.6	15.1	13.6	After 2 weeks, wt. still 108% of original and dimensions 102% of original values
Bakelite (phenolic)	0.0	0.0	0.0	0.0	Solvent has no effect
Zytel 101 (nylon 66)	0.0	0.0	0.0	0.0	Solvent has no effect
Plexiglas (methyl methacrylate)	0.1	−0.1	0.0	0.0	Solvent has little effect
Polystyrene	0.0	−0.1	1.5	2.0	Slight crazing of plastic. Turned milky
Saran (polyvinylidene chloride)	0.0	0.0	0.0	0.0	Solvent has no effect
Plaskon 8200 (nylon 6)	−0.1	−0.2	0.0	−2.6	After 2 weeks, weight was back to original value

TABLE VII

Swelling Characteristics of Various Plastics in Methylene Chloride

Plastic	% Change width	% Change length	% Change thickness	% Change weight	Remarks
Cellulose nitrate	—	—	—	—	Sample completely disintegrated
Polyvinyl alcohol	15.3	9.1	9.4	35.4	After 2 weeks, both dimension and wt. show approx. 1% decrease from original
Polyvinyl chloride	—	—	—	—	Sample completely disintegrated
Teflon (tetrafluoroethylene)	0.0	0.0	0.0	0.3	Solvent has little effect
Cellulose acetate	—	—	—	—	Sample completely disintegrated
Polyethylene	3.8	4.6	3.9	14.5	After 2 weeks, dimension and wt. approx. 99.5% of original values
Genetron VK	0.0	−0.1	2.5	1.4	After 2 weeks, weight and thickness still 101% of original values
Bakelite (phenolic)	0.0	0.0	0.0	0.0	Solvent has no effect
Zytel 101 (nylon 66)	0.0	0.0	0.0	1.1	Solvent has little effect
Plexiglas (methyl methacrylate)	—	—	—	—	Sample completely disintegrated
Polystyrene	—	—	—	—	Sample completely disintegrated
Saran (polyvinylidene chloride)	3.1	2.4	4.9	11.1	After 2 weeks, dimensions and weight show approx. 1% decrease from original values
Plaskon 8200 (nylon 6)	0.0	0.0	0.0	1.9	After 2 weeks, wt. back to normal

TABLE VIII

Swelling Index for Solvents

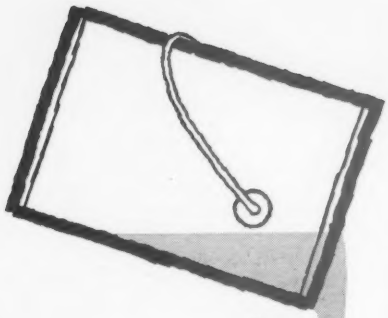
Propellent	Molecular Structure	Index
114a	CF_3-CCl_2F	32
113	CF_2Cl-$CFCl_2$	71
112	$CFCl_2$-$CFCl_2$	460
12	CCl_2F_2	94
11	CCl_3F	513
21	$CHCl_2F$	1901
Methylene Chloride	CH_2Cl_2	2215

and also a possible clue as to how the atomic constituents of the solvent molecule affected its attack on the plastics tested. The index for each solvent will be found in Table VIII.

Although it is apparent that there is some overlap in this index between the methane derivatives and the ethane derivative, if each group is examined separately, certain apparent and interesting relationships are noted. In the methane derivatives the following progression is apparent:

CH_2Cl_2 > Propellent 21 > Propellent 11 > Propellent 12

It appears that hydrogen in the molecule leads to greater swelling so that methylene chloride and Propellent 21 show a considerably larger effect on plastics than Propellents 11 and 12. Also, the effect



for that new distinctive

finish

Nacromer®

SYNTHETIC PEARL ESSENCE

Formulated for use with practically all coating vehicles... for application by almost any coating method, Nacromer transforms ordinary coating materials into eye-catching "sales-feature" finishes.

Coating users, on the alert for something different to make their products stand out, will be interested in Nacromer coatings because they are different . . because they add unusual beauty . . . and, because they're easy to use.

If you are looking for a new distinctive finish. why not try Nacromer?

NEW 8-PAGE HANDBOOK

Our new 8-page Nacreous Pigment Handbook and 4-page "Coating with Nacreous Pigments" brochure contain much valuable information on the use of Nacromer. Write for your copies today.

THE MEARL CORPORATION

41 EAST 42nd STREET, NEW YORK 17, N Y

of Propellent 12 is much less than that seen for Propellent 11, which would indicate that as the fluorine content of the molecule increases, the solvent's degenerative effect on plastics is decreased.

Looking at the ethane derivatives, it is apparent that increasing the fluorine content of the molecule decreases the swelling effects of the solvent, as shown by the following progression:

Propellent 114a <
Propellent 113 < Propellent 112.

It is, therefore, concluded that with the exception of plastics such as Nylon, Saran, Bakelite and Teflon, which show little deterioration when exposed to any of these solvents, a propellent having no hydrogen and a high fluorine content appears to be the least likely to cause trouble in an aerosol system containing a plastic.

Aerosol Filling Equipment Illustrated Catalog Available

A new 8-page, three-color, 8½ by 11-in. illustrated catalog (AC-60) describing Colton, Colton-Hope and Colton-Alpha filling equipment for the pharmaceutical, chemical, cosmetic, paint, plastics and food industries is now available from Arthur Colton Co., 3400 E. Lafayette, Detroit 7, Mich.

Colton equipment described in the catalog includes automatic metal and plastic tube fillers, closers and crimpers for pastes, creams and liquids; single, twin and multiple liquid fillers; and single-operation fillers, closers and crimpers.

Colton Hope-fillers for fills up to 1-gallon described and illustrated include multiple, automatic conveyorized, volumetric-fill types; single and twin straight-line models; can coders; rotary unscramblers; semi-automatic fillers and container infeed timing screws.

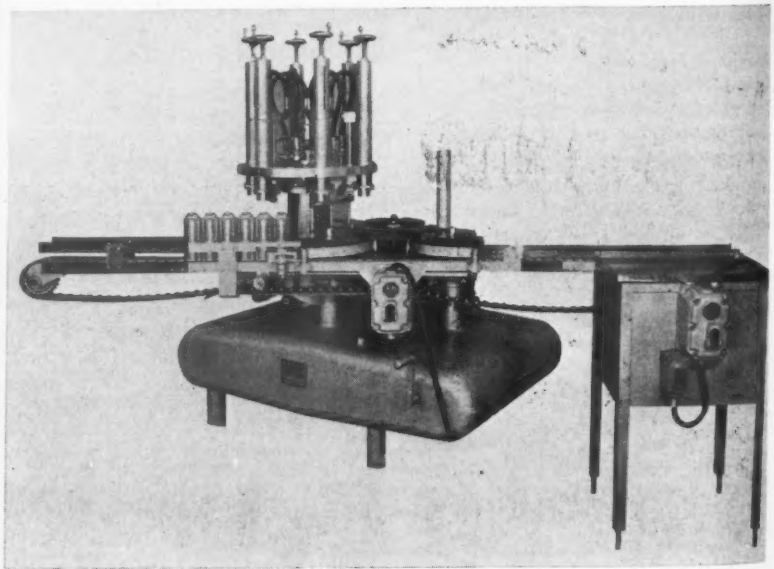
New Vacuum Crimper Debuts at Packaging Show

New rotary combination vacuum crimper and pressure filler for aerosol packaging will be shown for the first time by The Kartridg Pak Co., Franklin Park, Ill., at the National Packaging Exhibition, April 4, in Atlantic City, N. J.

A new rotary tip applicator for affixing the pressure release button to the filled can will also be announced as available. This is said to be the first rotary machine available for performing what is otherwise a slow and expensive manual operation.

In addition to the combination rotary unit, Kartridg Pak will also display a complete aerosol packaging laboratory unit for pre-testing, quality control, etc. and the 800 series automatic straight aerosol packaging line.

Kartridg Pak makes aerosol packaging equipment suitable for volume as low as 2500 or as high as 2,500,000 per year.



Kartridg Pak Vacuum Crimper

CELLOFILM

nitrocellulose solutions

No "buggy-lugging" of drums! No space wasted for drum storage! No money tied up in drum deposits! Tank wagon deliveries of Cellofilm nitrocellulose solutions is truly the modern, efficient way to use nitrocellulose. And, only Cellofilm offers tank wagon deliveries of nitrocellulose solutions **at any viscosity,** in any combination of solvents. Why not let our engineering department show you how your plant can be adapted to receive bulk deliveries? Write or phone today.

for over 40 years the solution for your problems

CELLOFILM INDUSTRIES, INC.

WOODRIDGE, N. J. • GEneva 8-7100

Dianol is certified by U.S. Testing Corporation.

..for added Selling Power

Dianol is available to paint manufacturers in 50-pound, triple-lined, waterproof bags.

Your Paint with . . . DIANOL Paint Insecticide

Kills All Household Insects

Now you can add complete insect extermination to your paint with Dianol Paint Insecticide. It mixes during manufacture with any type paint regardless of base. Guaranteed effective, Dianol is thoroughly tested and proven. It will not affect in any way the quality of your paint.

Your Paint with . . . DIANOL Anti-Mildew Compound

Gives Guaranteed Mildew Protection

Put your paint out in front with Dianol Anti-Mildew Compound for Paint. It offers great competitive advantage . . . complete and lasting mildew protection. Your paint with Dianol has new dimensions that preserve the lasting beauty of your paint. Mix during manufacture; no harmful ingredients, no mercury compounds.

For full processing facts and other Dianol information, **WRITE** ***now for the new booklet prepared especially for paint manufacturers.***

DIANOL
Dianol Division, Mills-Pearson Corporation

Department PV3
P. O. Box 10968
St. Petersburg, Florida

We invite inquiries from resident agents in foreign countries.

here's the SHAPE* for better grinding

DIAMONITE® high density GRINDING RODS

PRODUCTION DOUBLED IN HALF THE MAN HOURS DURING EXHAUSTIVE TESTING BY A LEADING PAINT MANUFACTURER

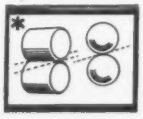
THE TEST

The Plant Superintendent reports: "After successfully testing high density media in a 15 by 21 inch steel ball mill we put a 40 per cent charge of Diamonite Grinding Rods in a 6 by 5 foot pebble mill with buhrstone lining and no lifter bars. Mill limitations and media weight made the lighter charge necessary and gave us a greater base product load. We operated the mill on a production basis rather than purely as a test".

THE RESULT

"In 1317 hours of running time the mill produced 62,500 gallons of finished enamel — an average of 47 gallons per mill hour — using the same formulation as with flint pebbles. Further experimentation proved that Diamonite Rods cut mill running time 60 per cent while maintaining the same production. Even with increased kreb units we more than doubled the mill's hourly output while cutting labor costs 50 per cent.

"In addition we found that products formerly run on roller mills could be satisfactorily dispersed in pebble mills using high density media and with resultant savings of 2000 direct labor hours annually. Our experience has proved to us that high density media has given the pebble mill greater flexibility and increased its overall usefulness."



Diamonite's scientific cylindrical shape affords consistently greater grinding surface that can help you achieve better grinding.

For further details on how these savings were achieved write for new Grinding Rod Brochure — a technical and informative bulletin offering full specifications.

DIAMONITE
products manufacturing co.
pioneers in the development of high alumina ceramics
shreve, ohio
Phone: JOseph 7-4211

DIVISION OF U. S. CERAMIC TILE COMPANY

Metal Container Firms Consolidate

MERGER of seven metal container manufacturers to form a new corporation was announced by Gordon D. Zuck, President of the new firm. To be known as Vulcan-Associated Container Companies, Inc., the new organization will have its headquarters and executive office at Birmingham, Ala.

The companies merged into the new corporation are: Vulcan Containers, Inc., Bellwood, Ill.; Vulcan Steel Container Co., Birmingham, Ala.; Southwestern Steel Container Co., Dallas, Tex.; Vulcan Containers Ltd., Toronto, Canada; Vulcan Containers Ltd., Vancouver, B. C., Canada; Vulcan Containers Pacific, Inc., San Leandro, Calif.; Atlantic-Vulcan Steel Containers, Inc., Peabody, Mass.

These companies manufacture a variety of sizes and styles of steel pails and drums and specialty tin cans for paints and lacquers, agricultural chemicals, insecticides, sanitary chemicals, soaps and waxes, printing inks, lubricating and industrial oils and greases, and food products.

Mr. Zuck, President of Vulcan-Associated, will headquarter at the Birmingham executive offices where he will head up the parent company's program of coordination of all activities of the seven merged firms.

He is president of the Birmingham, Dallas and Boston companies participating in the merger and has a wide acquaintance among manufacturers throughout the country.

Gordon D. Zuck
President

Mr. Zuck said that while the parent company will own all stock of the merged companies, each company will maintain its corporate identity and will operate individually in each area. The seven companies will each function under the direction of its board of directors and staff of officers.

"We don't want this to be just another big company," Mr. Zuck said. "We intend to offer a special type of personalized service to steel container users across the country that is not present with most big concerns," he said.

Vern I. McCarthy, Sr. will serve as Chairman of the Board of Directors of the new corporation. He will headquarter at Bellwood and will devote his efforts to over-all development programs of the companies including research and foreign operations. His father founded the Bellwood company in 1916. Vern, Sr. became President in 1942. In December, 1959, he became Board Chairman and turned the presidency of the Bellwood company over to his son, Vern, Jr., who is now the third generation to head up that organization.

Vern I. McCarthy
Chairman, Board of Directors

Fred A. Kusta, Vice President of Vulcan Steel Container Co. in Birmingham and Vice President of Southwestern Steel Container Co. in Dallas will serve as Executive Vice President of the new parent company. He has been in the container manufacturing business since 1947. He will handle the synchronizing of procedures, plant and mechanical improvements, and will supervise the exchange of ideas, methods and talents, and expansion programs.

Paul H. Oberholtzer is the Secretary of the new firm and will have charge of accounting procedures and their coordination among the seven firms.

Vern J. McCarthy, Jr. is Treasurer of the associated company. He will devote his time to the position of President and Director of Sales of the Bellwood Company.

New 4,000-square-foot modern, air conditioned, headquarter office building is nearing completion for Vulcan-Associated Container Companies, Inc. Executive offices are located at 3075 North 35th Avenue in Birmingham, Alabama.

NEWS

Century Reports Growth

A new and unusual chemical complex, Century Chemical Corp., unique in that it was formed for the acquisition of existing chemical producers, is emerging as a dark horse in the chemical industry, showing phenomenal growth during its 12-month existence, declares Theodore S. Hodgins, President. Formed in 1958 with a capitalization of $350,000, this unusual company today reports gross annual sales of some $10,000,000, he revealed.

Since its formation in 1958, Century has taken over Wilson Organic Chemicals, Sayreville, New Jersey; Chemo Puro Manufacturing Corporation, Oil & Chemical Terminals, Inc., and the Asphalt Division of Oil & Chemical Products, Inc.—all of Newark, New Jersey; plus Chemo Puro AG, a European sales organization with headquarters in Zurich, Switzerland and offices in Amsterdam, Holland; Hamburg, Germany; and Florence, Italy; Hodgins reported. Each subsidiary (Asphalt is a division of Century) implements one or more phases of Century's operations.

"Our long-range plans were based on the production of chemical intermediates, and we organized our corporate structure to permit flexible expansion into a wide variety of products," said Mr. Hodgins.

Wilson Organic Chemicals, Inc., first Century acquisition, is the largest independent U. S. manufacturer of phthalocyanine dyes and pigments used as coloring and filling materials for automotive lacquers and enamels, interior and exterior paints, vinyl and linoleum floor coverings, and rubber and plastics products. The company also manufactures aromatic fine chemicals and intermediates for the drug and pharmaceutical industries, and is currently the only U. S. producer of meta-aminophenol, base component of the newly-developed tuberculosis drug.

Flynn Elected NAEM Vice-Pres.

C. Homer Flynn, Executive Secretary of the Federation of Societies for Paint Technology and Manager of the Federation's Paint Industries' Show, was elected Vice-President of the National Association of Exhibit Managers at the organization's annual meeting held recently in Dallas, Tex.

NAEM, an association of industrial show managers, is dedicated to the advancement of the arts and sciences pertaining to education through the use of exhibits, exhibitions, and expositions for the dissemination of knowledge and information.

Belgian Du Pont Plant

Production has started at the paint plant of Du Pont de Nemours (Belgium) S. A; full production will be achieved by March 1960 to supply markets in the Benelux countries. It is expected that other European countries can be supplied later next year.

Du Pont de Nemours (Belgium) S. A. is a wholly owned subsidiary of E. I. du Pont de Nemours and Co. The Belgian plant will produce lacquers, enamels, paints, varnishes, and thinners for the automotive, automotive refinish, industrial, and household maintenance uses.

Now these two proved are making a new family

In 1947, National Lead Company announced a revolutionary new pigment, *45X** basic silicate white lead. Because of its unique structure, this pigment provided white lead in a more efficient form than ever before, and paint makers were able to make important improvements in formulations containing white lead.

In 1956, National Lead Company put a second revolutionary new pigment on the market, *M50*® basic lead silico chromate. A rust inhibitor, this pigment, too, proved highly efficient. And, unlike other rust inhibiting pigments, it was weather resistant. With *M50* pigment, paint makers developed outstanding new metal protective paint systems that provide all-coat corrosion protection and weather protection...and in a wide variety of colors.

Both developments stemmed from research, begun more than 25 years ago at National Lead Laboratories, to devise more efficient reactive pigments. Brought to light by the early investigative work was the concept that such a pigment should have a low-specific-gravity inert core supporting a chemically reactive (or otherwise functional) surface compound.

Market acceptance of paints made with *45X* and *M50* pigments amply demonstrates the validity and utility

NEWS

Stock Exchange

Hercules Powder Co. and Imperial Color Chemical and Paper Corp. announced that both companies have agreed in principle to the acquisition of the business and assets of Imperial in exchange for Hercules stock.

If the boards of directors of both companies approve a formal agreement now in preparation, and the stockholders of each company authorize the steps necessary for completion of the transaction in March meetings, the 1,019,604 shares issued and outstanding of Imperial common stock will be exchanged for 509,802 shares of a new class of Hercules stock, to be designated $2 Cumulative Convertible Preferred Stock. The new stock will be subordinate to the existing Hercules 5% preferred stock, and will be non-callable for 5 years.

Plan New Technical Center

Pennsalt Chemicals Corp., has concluded negotiations with Cabot, Cabot & Forbes to purchase a 50-acre site in the King of Prussia Park for construction of a technical center which will ultimately represent an investment of $6,000,000. This park, located at the Valley Forge Interchange of the Pennsylvania Turnpike, is one of 14 industrial parks developed by Cabot, Cabot & Forbes along the eastern seaboard.

New Distributor

Donald McKay Smith, Inc. has been named by J. M. Huber Corp. as exclusive distributor for its series of "Huber" kaolin clay extenders and Zeolex synthetic silicate pigments to the paint, varnish, printing ink, plastics and specialty processing industries in Northern Ohio, excepting Toledo.

Warehouse stocks will be maintained for less-than-carload customers. The Huber raw materials will complement other raw material supplies now being carried by the Smith Company to service the above industries.

New Oxide Condensates

Monsanto Chemical Co.'s Inorganic Chemicals Div. has announced the expansion of its line of nonionic surface active agents with the addition of alkyl phenol-based ethylene oxide condensates.

Monsanto already markets alcohol—and mercaptan-based nonionics and for years has been the nation's largest producer of tall oil-ethylene oxide condensates.

Interim production of the dodecyl phenol and nonyl phenol-based products is already underway at the company's Kearny, N. J., and Everett, Mass., plants.

Company Inks Record Sales

The 1959 annual report of The California Ink Co., Inc., shows record sales during the fiscal year ended September 30, of $17,699,000 and a net income of $718,800, an increase of 63% over the fiscal 1958 income. On a per-share basis, the firm earned $2.04 in 1959 compared with $1.25 in 1958.

Board Chairman Chalmers G. Graham and President John C. Lyman in their message to the stockholders attribute the improved earnings to successful new products introduced during the year to the packaging, publishing, printing and paint industries—to cost reductions effected in many operating areas—and a strengthened organization.

ve pigment developments
nily name for themselves!

tive pair of the surface-reactive, inert-core
at corr pigment concept, and researchers
r protec re now developing a family of these
of color efficient pigments.

temme 45X and *M50* pigments thus be-
ore tha come forerunners of a new line of
ead La pigments, unique in composition,
efficien structure and efficiency. To identify
to lig this line, National Lead has selected
ork wa a family trademark, "ONCOR."*

Individual pigments within the line will be further identified as are *45X* and *M50* pigments by letter, numeral, and chemical character.

45X and *M50* pigments are now to be shipped in "ONCOR" packages. Picture above shows how they look with the new markings. No changes in product composition, manufacture or performance. *Trademark

oncor TRADEMARK

pigments...development of

National Lead Company

General Offices: 111 Broadway, New York 6, N.Y.

NEWS

Davis-Seidlitz Consolidate

Consolidation of operations and resources of two of the nation's largest independent regional paint manufacturers, the H. B. Davis Co., Baltimore, Md., and Seidlitz Paint & Varnish Co., Kansas City, Mo., has been announced by officials of the two companies.

H. Braith Davis and G. R. Seidlitz, presidents of their respective companies, said that following five years of discussion and negotiations, merger plans had been successfully completed and became effective January 1.

The consolidation, which includes the four wholly-owned subsidiaries of the two parent companies, was given approval by directors and stockholders of both the Davis and Seidlitz firms at meetings in December, 1959.

John W. Masury & Son, Inc., Baltimore, Md., and Masury Paints of Texas, Inc., Houston, Texas, are Davis subsidiaries. W. H. Sweney & Co., Inc., St. Paul Minn., and Seidlitz Paints of Texas, Inc., Houston, Tex., are the Seidlitz-owned firms included in the merger.

While both companies and their subsidiaries will continue as independent operations under present management and personnel, both firms will become part of a surviving or overriding corporation to be known as Consolidated Coatings & Chemicals, Inc., with headquarters in Kansas City, Mo.

Emery Industries' Executive Vice President A. W. Schubert turns the first "shovelful" of earth for the company's $6,000,000 expansion of ozone oxidation facilities while Emery's organic chemical sales representatives look on. Immediately flanking the scoop are K. K. Boyd (right), Vice President of the Chemical Products Div., and R. F. Brown, organic chemical sales manager. The ground-breaking climaxed the recent sales meeting of the Organic Chemical Sales Dept., which included sessions devoted to product utilization and planning.

PHOTOVOLT
pH Meter MOD. 115

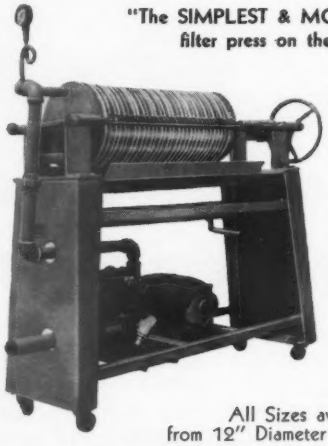
A full-fledged line-operated pH Meter of remarkable accuracy at the moderate price of $175.-
(complete incl. electrodes)

Write for bulletin #225 to

PHOTOVOLT CORP.
95 MADISON AVE. NEW YORK 16, N. Y.

Star LOW COST FILTER PRESS for RAPID FILTRATION

"The SIMPLEST & MOST EFFECTIVE filter press on the market."



For Use on —
Varnish
Lacquer
Alkyds
PVAc Emulsions
Phenolic Resins
Melamine Resins
Latex Emulsions
Shellac
Water Solutions
Acrylic Emulsions
Colloid Solutions
etc., etc.

All Sizes available —
from 12" Diameter to 30" Diameter

Write for our **FREE 85 Page Catalog** — it contains Illustrations, Data Sheets, PRICES and many useful charts and tables.
Manufacturers & Designers of
PROCESSING EQUIPMENT Since 1904
PVAc Plants - Acrylic Emulsion Plants - Phenolic Resin Plants - Alkyd Resin Plants, etc., etc.

Star TANK & FILTER CORPORATION
875 Edgewater Rd., New York 59, N. Y.
Phone DAyton 3-6450

NEWS

New Phenol Plant

The Dow Chemical Co. announces it will construct a phenol plant with a capacity of 36 million pounds per year in the pacific northwest.

The plant will be built at a location still to be selected on deep water at Puget Sound, or in the Longview, Washington, or the Portland, Oregon, area. Options on some sites have been secured and others still are under study.

Several million dollars will be spent on property development and plant construction before operations begin early in 1961.

Dow said construction of the phenol plant is the first step in the planned development of an integrated chemical and plastics manufacturing operation in the northwest. This integrated operation will be built over a period of several years to produce chemical materials important to the region's growing economy.

Witco to Expand

A new laboratory and plant-office building for Witco Chemical Company, Inc., is now under construction in Los Angeles, Calif.

Located on the site of two Witco plants—one, an organics chemical division operation for metallic stearate production, the other, an ultra chemical sulfonation unit—the installation will provide both with expanded and modernized laboratories for control and customer services.

Completely new equipment and air conditioning throughout are included in the project plans.

New Maleic Anhydride Plant

Heyden Newport Chemical Corp. is proceeding with the building of its new maleic anhydride plant at Fords, New Jersey.

The new plant, the first maleic anhydride venture for Heyden Newport, is being designed and built by Scientific Design Co., Inc. and will have a capacity of 24,000,000 pounds per year. The anticipated onstream date for the new plant is during the fourth quarter of 1960.

New Tung Lab Opens

Trade problems in the use of tung oil in coatings formulations have now become problems of the Pan American Tung Research and Development League as the league's newly equipped laboratory swings into full-time operation.

The laboratory, financed by dues paid to the Tung Research and Development League and the Comision Argentina del Tung, a similar organization in Argentina, was established in order to work out problems encountered by the consuming coatings industry in their use of tung oil for making superior paint and varnish products.

The laboratory is only a part of a comprehensive program begun by the research league in an effort to further the use of tung oil by the coatings industry. The program also includes work at university level, research in Argentina, an education program on the superior qualities of tung oil, and a technical man to call on the consuming coatings industry in its Roland R. Becke, Secretary-Manager of the League.

Staffing the laboratory, located in Picayune, Miss., is Robert S. Zetterberg who has been working in the laboratory since October, 1959.

Mr. Zetterberg came to the laboratory from Crosby Forest Products Co. where he spent one year working in the tung laboratory and two years in the paint laboratory.

R·T·VANDERBILT·CO·N·Y·
RAYOX
AMERICAN PRODUCTS

PURE TITANIUM DIOXIDE

•

Rutile and Anatase

•

R. T. VANDERBILT CO., INC.

230 PARK AVENUE • NEW YORK 17, N. Y.

NEWS

Wilson Retires

Ernest S. Wilson has retired December 31 as director of engineering for Hercules Powder Co., upon completion of 36 years' service with the company. He has been director of engineering for the last twelve years, and a member of the board of directors for five years.

Mr. Wilson headed the Hercules Engineering Dept. at the time of the company's greatest expansion, after World War II, and more particularly at a time when chemical engineering became more complex year by year. During World War II, Mr. Wilson bore much of the responsibility for constructing six ordnance plants in the shortest possible time, for use by the government in the manufacture of gun propelants.

Navy Report Tells How to Disperse Teflon in Water

To obtain a stable dispersion of Teflon in water, say Navy chemists, surface tension of the liquid must be near that of the solid Teflon particles, a condition best reached by use of a mixture of conventional wetting agents. A report of their recent study of Teflon dispersions has just been released to industry through the Office of Technical Services, U. S. Department of Commerce.

Army research aimed at extending the uses of graphite by lowering its high rate of oxidation has shown silicon carbide to be the best of a number of oxidation-reducing impregnants. A report of that work and another describing developments of a heat-reducing plastisol coating for handwheels also are available.

New Distributor

The Smith Chemical & Color Co., Inc., 55 John St., Brooklyn 1, New York announces its appointment by the organic chemicals division of Olin Mathieson Chemical Corp. as a warehousing distributor of its extensive line of glycols, poly glycols, gylcol ethers, ethanolamines and surfactants.

Tank-car, carload and truckload shipments of these organic chemicals direct from the Doe Run, Kentucky plant as well as less truckload drum deliveries from Brooklyn warehouse stocks are promptly available.

Plastics Program Planned For April Conference

Plans are underway for the annual regional technical conference to be held April 20, 1960, at the Hotel Texas in Fort Worth, Tex., Ray S. Perkins, Southwestern Plastic Pipe Company of Mineral Wells and chairman of the RETEC has announced. It will be sponsored by the North Texas Section, Society of Plastic Engineers.

The subject is *Plastics in the Petroleum and Chemical Industries.* The program will be offered in two concurrent sessions with papers being presented on both surface coatings and plastic structures, covering the most recent developments in both fields.

Program chairman, A. L. Barrier of Barrier Corporation, Mineral Wells, Texas and R. B. "Pipe" Bender of Texas Plastics Materials, Fort Worth, said speakers and their topics will be announced later. Perkins urged equipment and corrosion engineers, as well as people engaged in the various phases of the plastics industry, to attend.

CALL ON WHITTAKER FOR . . .

ULTRAMARIE BLUE

Sole U. S. Sales Agents for

RECKITT'S COLOURS Ltd.

★399★

MAGNESIUM SILICATE S.F.

MAGLITE® D

(Reactive Magnesium Oxide)

MAGNESIUM SILICATES
Low Micron • Uniform
CALCIUM CARBONATES
CLAYS • BENTONITE • PUMICE
METALLIC SOAPS • MICA • ASBESTOS

MAGNESIUM CARBONATE
MAGNESIUM OXIDES • SILICAS
ANTIMONY OXIDE
FUNCTIONAL PIGMENTS
Extenders

WHITTAKER

Whittaker, Clark & Daniels, Inc.
100 Church St., New York, N. Y.

NEWS

Meeting-in-Miniature Highlights Organic Coatings

A Meeting-in-Miniature of the New York Section of the American Chemical Society took place March 11 at the Hotel Roosevelt, New York City.

One of the papers discussed was entitled *Test Methods for the Water Vapour Permeability and Heat Reflectance of Pigmented Organic Coatings.*

It was prepared by Max Kronstein, Richard M. Sonshine and Joseph A. Castronovo, Jr., all of the Research Div., College of Engineering, New York University.

Water vapour permeability is an important factor in the behavior of organic coatings in corrosion preventive systems and in electrical insulation. The paper discussed a method of preparing free films of organic coatings and applied the method to the study of a number of free films of varied formulations. The effect of the particle shape and size of the pigments in the organic films was discussed; in particular, to what extent a platy mica pigment influences the water vapour behavior in accordance with the chemical purification and the preservation of its particle shape.

The second part of the paper presented a method for studying the heat reflectance of coatings with respect to variations in the pigment particle shape and size, using test paints which produce with the various pigments paint films of approximately the same specular reflectance. An acrylic latex compound was used for these studies. A frame is used for the exposure of the test panels to heat radiation of an infrared light bulb, and the differences of temperature above and in a designated space below the test panels is measured as a factor of the time of exposure to the radiation.

United to Realign

Morrison M. Bump, executive vice president of United Carbon Co., Inc. has announced a major realignment and expansion of United's domestic and international marketing operations. He also announced the establishment of a Marketing Committee.

"Our expansion and relocation of marketing functions is aimed," he said," at speeding up product development improving delivery schedules, intensifying laboratory and in-field technical service. In general, it means more and broader personal service to our customers and faster reactions to the requirements of the industries we serve.

"The new Marketing Committee has offices in New York, Houston and Akron. By means of monthly committee meetings our group will keep on top of the fast-changing needs of the carbon black and black masterbatch industries. Special progress reports will be immediately forwarded to all local sales personnel. The prime purpose of the committee is to support the sales representative in constantly improving service," he concluded.

New Distributor

Chemicals & Pigments Corp., 227 California St., Newton 58, Mass., has been appointed to handle the New England distribution of the extensive lines of organic pigments and oil-and spirit-soluble dyes manufactured by the Dyestuff and Chemical Division, General Aniline & Film Corp.

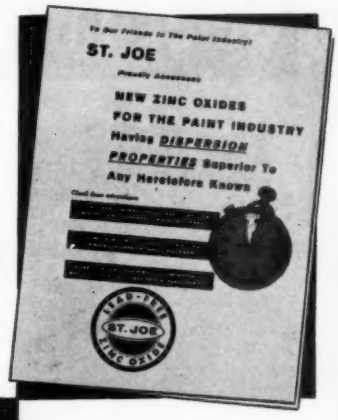
HOW ST. JOE'S NEW

"SUPER-DISPERSIONABLE"

ZINC OXIDES

Can Improve Your Production

St. Joe's new processing technique produces zinc oxides with unprecedented dispersion properties. The new ZnO particles are completely free of agglomerates and believed to have a slight electrical charge which causes them to repel each other . . . thus accelerating and insuring dispersion.



The booklet shown here contains evidence of how St. Joe "SUPER-DISPERSIONABLE" Zinc Oxides give you a better product in less time. In it you'll find graphs of Hegman Gage readings comparing

St. Joe Green Label #45 vs. four competitive Acicular Zinc Oxides
St. Joe Green Label #17 vs. two competitive Nodular Zinc Oxides
St. Joe Green Label #17 vs. three other competitive grades

Send for your free copy today.

ST. JOSEPH LEAD CO.

250 Park Avenue
New York 17, New York
Plant & Laboratory: Monaca (Josephtown) Pa.

ZnO-154

WATER GROUND
MICA
ALSIBRONZ
EXTENDER PIGMENTS
for:
PRIMER-SEALERS
HOUSE PAINTS
LATEX-EMULSIONS
FRANKLIN MINERAL PRODUCTS
COMPANY
FRANKLIN, NORTH CAROLINA
INCORPORATED 1926
Agents in Principal Cities

NEWS

North Dakota Agric. College Announces Symposium

The Coatings Technology Department at the North Dakota Agricultural College announces the second Symposium on *New Coatings and New Coatings Raw Materials* will be held in the School of Chemical Technology on the college campus, June 6-9.

The Symposium will cover the recent developments in coatings and their base materials, namely, alkyd, oil and latex emulsions, urethanes, fungistats, silicones, polyesters, vinyl polymers, epoxy oils, water soluble oils, new epoxy related resins, and poly functional acids in alkyd resin technology. Specialists will treat each subject from the theoretical and practical points of view. The discussions are designed for group leaders and senior chemists.

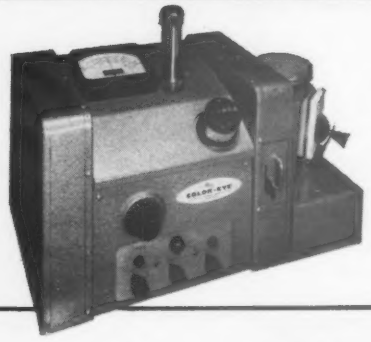
CALENDAR

Mar. 16-19. Annual Meeting of the Southern Paint and Varnish Production Club, Atlanta Biltmore Hotel, Altanta, Ga.
Mar. 28. 5th Symposium, Louisville Society for Paint Technology, Sheraton-Seelback Hotel, Louisville, Ky.
May 13-14. Annual Symposium, Pacific Northwest Paint and Varnish Production Club, Olympic Hotel, Seattle, Wash.

PRODUCTION CLUBS

Baltimore, 2nd Friday, Park Plaza Hotel.
Chicago, 1st Monday, Furniture Mart.
C.D.I.C., 2nd Monday.
Cincinnati — Oct., Dec., Mar., May, Hotel Alms.
Dayton — Nov., Feb., April, Suttmilers.
Columbus — Jan., June, Sept., Fort Haves Hotel.
Cleveland, 3rd Friday, Cleveland Engineering & Scientific Center.
Dallas, 1st Thursday after 2nd Monday, Melrose Hotel.
Detroit, 4th Tuesday, Rackham Building.
Golden Gate, 3rd Monday, Sabella's Restaurant, San Francisco.
Houston, Monday prior 2nd Tuesday, Rams Club.
Kansas City, 2nd Thursday, Pickwick Hotel.
Los Angeles, 2nd Wednesday, Scully's Cafe.
Louisville, 3rd Wednesday, Seelbach Hotel.
Montreal, 1st Wednesday, Queen's Hotel.
New England, 3rd Thursday, University Club, Boston.
New York, 1st Thursday, Brass Rail, 100 Park Ave.
North Carolina, 3rd Wednesday, Rainbow Supper Club, High Point.
Northwestern, 1st Friday, St. Paul Town and Country Club.
Pacific Northwest, 3rd Thursday, Washington Athletic Club, Seattle, Wash.
Philadelphia, 3rd Wednesday, Philadelphia Rifle Club.
Pittsburgh, 1st Monday, Gateway Plaza, Bldg. 2.
Rocky Mountain, 2nd Monday, Republican Club, Denver, Colo.
St. Louis, 3rd Tuesday, Kings-Way Hotel.
Southern, Annual Meetings Only.
Toronto, 3rd Monday, Oak Room, Union Station.
Western New York, 1st Monday, 40-8 Club, Buffalo.

Color Control WITH COLOR-EYE®



For the Paint Industry . . .
COLOR-EYE makes rapid production shading a practical reality. In addition, Color-Eye provides numerical, non-drifting color standards and accurately determines the closeness of the final color match.

This unique combination of a colorimeter and abridged spectrophotometer measures color differences directly or against a permanent reference standard. For use in production or laboratory, Color-Eye is completely portable, rugged and stable.

Write for complete brochure

IDL
INSTRUMENT DEVELOPMENT LABORATORIES, INC.
Specialists in Photometric Analysis
67 MECHANIC STREET, ATTLEBORO, MASS., U. S. A.
Subsidiary of ROYAL McBEE CORPORATION

Latest Paint Making and Testing Equipment Featured at New Glidden Research Center

Lab will provide product control of all Titanium Dioxide production.

THE latest scientific equipment for work with pigments and other inorganic chemicals used by the paper, paint, rubber and plastics industries is concentrated under one roof in the new Inorganic Research and Development Center dedicated by The Glidden Co.'s Chemicals Div.

Housed in a new two-story building at Glidden's Adrian Joyce Works, one of the nation's largest titanium dioxide manufacturing facilities, the center consolidates research, product development and technical service facilities previously located in units scattered throughout the country.

"The Glidden Company believes that one of the most promising potential markets for titanium dioxide lies in the papermaking industry, and this laboratory is equipped with papermaking and coating facilities to develop pigments of superior quality for these end-uses," stated George M. Halsey, Glidden vice president who directs its Chemicals Div.

Mr. Halsey pointed out that the new Center's research and development department, which has an operating miniature paper plant, contains advanced equipment not duplicated by the paper industry itself.

In addition to the paper laboratory, the center contains a paint laboratory featuring a complete range of paint making and testing equipment to evaluate pigments for the paint and printing ink industries. The laboratory will also provide finished product control of all titanium dioxide production at the Adrian Joyce Works.

Other departments in the center include a development laboratory, a division research laboratory, a plastics and rubber laboratory, a research library and an instruments laboratory featuring an electron microscope, various types of x-ray apparatus and spectroscopic analysis equipment.

Herbert L. Rhodes is manager of the new Inorganic Research and Development Center. Other laboratory executives include: A. C. Dreshfield, director of paper research; C. A. Tanner, Jr., director of development; Dr. Reuben Roseman, director of research; Richard W. Dye, supervisor of the instrument laboratory and the plastics and rubber laboratory, and George B. Taylor, director of the paint service laboratory.

Present at the dedication of the new center were editorial representatives from the major trade magazines in fields the new facility will serve.

Glidden executives present, in addition to Mr. Halsey and the laboratory heads, included George S. Warner, vice president—operations of the company's Chemicals Div.; Ralph B. Quelos, general sales manager of the division; E. W. Cooper, manager of the Adrian Joyce Works, and W. K. Kelley, manager of the division's cadmium, pigment and lithopone operations.

"Our new research Center, located adjacent to our large production facility, the Adrian Joyce Works, will enable us to provide our customers with the finest possible products and service," Mr. Halsey said.

Pigments are dispersed in a vinyl plasticizer on the three roll mill.

Technician sprays panel for exposure testing in Florida.

Panel is prepared for color comparison and testing stability upon baking.

PERSONNEL CHANGES

BROOKFIELD ENGINEERING

Joseph M. Devine has been appointed New England Sales Representative for automatic viscosity control equipment in Stoughton, Mass.

NATIONAL CAN

Robert S. McClintock, Jr., has been named assistant to the president, Chicago, Ill.

R. S. McClintock

C. P. Albus

COLTON CHEMICAL

Charles P. Albus has joined the polymer research group in Cleveland, Ohio.

DUPONT

Appointments for three members of the Pigments Dept., Edmond C. Botti, William R. DeValinger, Jr., and Barton K. Feroe, were announced.

WITCO CHEMICAL

A. M. Eggeman has been promoted to director of purchases.

He replaces **Michael D. MacBurney,** who was recen ly appointed general manager of the company.

A. M. Eggeman

D. M. Joseph

CIBA

Donald M. Joseph has been appointed vice president and general manager, Fair Lawn, N. J.

CARGILL

Robert J. Coons, chemist, has been named to the research staff.

CELANESE DEVELOPMENT

William M. Shine has been appointed Vice President, N. Y.

UNITED CARBON

Morrison Bump, Executive Vice President, announced a major realignment and expansion of the firm's domestic and international marketing operations. He announced the following:

John F. Bahm, Manager, International Sales;

James R. Boyle, Manager, Carbon Black and Rubber Sales;

Harry Bowen, Manager, Distribution;

Frank O. Holmes, Jr., Manager, Laboratory Technical Service;

Russ Matthes, Manager, Advertising and Public Relations;

James A. Myers, Manager, National Account Sales;

Carl W. Snow, Manager, Field Technical Service.

In a marketing committee advisory capacity, Mr. Bump announced the following appointments:

Ely Balgley, Manager, Market Research;

Dr. Isaac Drogin, Senior Technical Advisor.

VULCAN CONTAINERS

Robert W. Hofmann has been named to the newly created post of Technical Service Representative, Bellwood, Ill.

R. W. Hofmann

F. J. Stief

METALS DISINTEGRATING

Fred J. Stief has joined the Pigments Div. sales staff, Elizabeth, N. J.

PENNSALT CHEMICALS

George D. Grogan has been named General Sales Manager of the Industrial Chemicals Div. He succeeds **George R. Lawson**, recently appointed General Manager of the Chemical Specialties Div.

GENERAL MILLS

Henry L. Ritell has been appointed New York district sales manager for the Chemical Div. Mr. Ritell succeeds **A. G. deMeurisse,** who was recently promoted to the post of national field sales manager for the Chemical Div.

BUHLER BROS.

Berndt Wullenweber and **Frank Kaiser,** have been named Vice Presidents, Englewood, N. J.

LACQUER CORP.

Caspar "Casey" Barbera has been named Chief Chemist, Brooklyn, N. Y

SUN-TESTED
VELVA-GLO®
FLUORESCENT PIGMENTS
...give you a breakthrough in color for product development. Nothing else approaches Velva-Glo for capturing and holding attention.
Eight exciting new colors: blue, cerise, chartreuse, red, orange-yellow, orange-red, orange, pink – for your paints, inks, plastics, latices, and coatings. Write today for free samples of pigments and Technical Bulletin No. 59.
RADIANT COLOR COMPANY
830 Isabella St., Oakland 7, California
461 W. Erie St., Chicago 10, Ill. • 249 W. 29th St., New York 1, N. Y.
Manufacturers of Velva-Glo fluorescent pigments, paints, papers, cardboards, fabrics
18

CLASSIFIED ADVERTISEMENTS

Rates: $.20 per word, except those seeking employment, for which rate is $.10 per word. Minimum: ten words. Address all replies to Box Number, c/o Paint and Varnish Production, 855 Avenue of the Americas, New York 1, New York.

HEAD CHEMIST REQUIRED

Medium sized paint manufacturer has an excellent opportunity for the right man, to take charge of our modern, air conditioned laboratory. Applicant must possess the following qualifications:

(1) B.S. in Chemistry (minimum).
(2) 5 to 15 years experience in paint laboratory.
(3) Must be able to take charge of men.
(4) Experience in formulating.

Our staff has been advised of this advertisement. This position is available in Toronto, Canada. Send resume including salary requirements to Box 2602.

SALES REPRESENTATIVE

Pigments: Oxides—Chromates, etc. Sales representative wanted. Choice of territory. Liberal arrangements. Box 3601.

CHEMIST

Well established manufacturer in Pacific Northwest needs chemist experienced in exterior-interior finishes. Consistent sales gains indicate excellent future. Company does business nationally. An excellent opportunity to grow with a growing company. State age, salary desired, experience. Reply Box 3602.

RESIN KETTLES

2—3,000 gallon (18,000 lbs. Solid Charge), 7′ diameter by 10′. Stainless with turbine agitator, cooling coils. Reflux tank and condensors each with new never used Selas gas units or one Trent electric jacket. Excellent condition equipment being replaced with larger units by synthetic resin manufacturer. Write Box 3603.

GOOD USED MACHINERY

1-Kent 6" x 14" 3 Roll Hi Speed Mill with Motor and Drive

2-J. H. Day 14"x32" High Speed 3 Roller Mills. 25 12-1 2 HP

1-Patterson 3' x 4 Jacketed Ball Mill. 10 HP Explosion Proof Motor

2-Abbe Engineering 4' x 3' porcelain Lined Pebble Mills. 5 HP Mtr & dr.

1-Du Pont 5' x 2'6" Jacketed Ball Mill. 20 HP Ex Proof Motor

1-J. H. Day 100 gallon Double Sigma Mixer. Jacketed heavy duty

4-Heavy Duty Paste Mixers, 250, 375 and 400 gallon capacities

6-Sparkler Filters, Model VR-17-12, VR-17-6, & Model 14D-4, w/Pumps

For any item you need, wire or phone collect GA 1-1380

ME MACHINERY AND EQUIPMENT COMPANY
123 Townsend St. · San Francisco 7, California

Please...

When you change your home or company address . . .

Mail old address as shown on magazine wrapper plus new address directly to PVP four weeks prior to moving.

Please include the following information about yourself: Title, Company, Nature of Company's Business.

Subscription Dept.
Paint & Varnish Production
855 Ave. of the Americas
New York 1, N.Y.

ORGANIC PIGMENTS

SALES DEVELOPMENT— TECHNICAL SERVICE

Well established chemical specialty manufacturer, New York City vicinity, with extensive research program introducing a high quality range of organic pigments needs

1) SALES DEVELOPMENT MANAGER with broad knowledge of pigment consuming industries to develop a sales and service program for a new line of pigments

2) TECHNICAL SERVICE MANAGER with practical knowledge and experience in the application of organic pigments to establish a product development and customer service laboratory.

Salary commensurate with experience and qualifications

Reply Box No. 3605

ADVERTISERS' INDEX

Abbé Engineering Co. ..... Feb.
Allied Chemical Corp., National Aniline Div. ..... Insert 19, 20
C. M. Ambrose Co. 68
American Can Co. 57
American Cyanamid Co., Plastics & Resins Div. ..... 3rd Cover
American Felt Co. ..... Feb.
American Tung Oil Assn. ..... Feb.
American Zinc Institute 74
American Zinc-Sales Co. 66
Archer-Daniels-Midland Co. ..... Feb.
Atlas Electric Devices Co. ..... Feb.

Baker Castor Oil Co. 36
Brighton Corp. 58

California Ink Co. ..... Feb.
Cargill, Inc. 10
Celanese Corp. of Amer., Chemical Div. 25
Cellofilm Industries 91
Columbian Carbon Co. (Dispersions) 12
Commercial Solvents Corp. 13
Continental Can Co. ..... Insert 63

Davies Can Co. 76
Diamond Alkali Co. 62
Diamonite Products Mfg. Co. 92
Dianol Div., Mills-Pearson Corp. 92
Dow Corning Corp. 46
DuPont de Nemours & Co., Inc., E. I., Electrochemicals Dept. ..... Feb.
DuPont de Nemours & Co., Inc., E. I., Explosives Dept. 14

The Eagle-Picher Co. 17
Eastern States Petroleum & Chemical Co. 70
Eastman Chemical Products, Inc. 6
English Mica Co. 56
Enjay Co. 65

Fein's Can Corp. ..... Feb.
Filpaco Industries, Inc. ..... Feb.
Franklin Mineral Products Co. 100

General Tire & Rubber Co., Chemical Div. 16
Georgia Kaolin Co. ..... 4th Cover
Georgia Marble Co. 18
The Glidden Co., Chemicals-Metals-Pigments Div. ..... Insert 37
B. F. Goodrich Chemical Co. ..... Feb.
Goodyear Tire & Rubber Co., Chemical Div. 15
W. R. Grace & Co., Grace Chemical Div. 8

Harshaw Chemical Co. 49
Hercules Powder Co., Paper Markers Dept. 64
Herman Hockmeyer & Co. ..... Feb.
J. M. Huber Corp. 22

Instrument Development Laboratories, Inc. 100
International Talc Co. 71

Johns-Manville Corp. 38

Spencer Kellogg & Sons, Inc. 80
Kentucky Color & Chemical Co., Subsidiary of Harshaw Chemical Co. 77
Karl Kiefer Machine Co. ..... Feb.
H. Kohnstamm & Co., Inc. 72

J. M. Lehmann Co., Inc. 50

Machinery & Equipment Co. 103
Manufacturers Engineering & Equipment Corp. ..... Feb.
Marbon Chemical Div., Borg-Warner Corp. 23
McDaniel Refractory Porcelain Co. 69
Mearl Corp. 90
Metalsalts Corp. 75
Metals Disintegrating Co. 11
Metasap Chemical Co., Subsidiary of Nopco Chemical Co. ..... Feb.
Mineral Pigments Corp. 30
Monsanto Chemical Co., Plastics Div. ..... Feb.

National Lead Co. 94, 95
New Jersey Zinc Co. 9
Newport Industries Co., Div. of Heyden Newport Chem. Corp. ..... Front Cover
Nopco Chemical Co. ..... Feb.

Oronite Chemical Co. 44

Pacific Vegetable Oil Co. 24
Patterson Foundry & Machine Co. Div of Ferro Corp. 3
Pennsalt Chemicals Corp. 85
Pennsylvania Industrial Chemical Corp. ..... Feb.
Photovolt Co. 96
Pittsburgh Coke & Chemical Co. ..... Feb.

Radiant Color Co. 102
Reichhold Chemicals, Inc. 4
Rohm & Haas Co., Resinous Products Div. ..... Feb.
Chas. Ross & Sons Co., Inc. ..... Feb.

St. Joseph Lead Co. 99
Shawinigan Resins Corp. 52
Shell Chemical Co. ..... 2nd Cover
Skelly Oil Co., Industrial Div. 21
Skinner Engine Co., Troy Engine Div. ..... Feb.
Sprayon Products, Inc. 78
Star Tank & Filter Corp. 96

Union Carbide Plastics Co., Div. of Union Carbide Chemicals Corp. 28, 29
United Carbon Co. ..... Feb.
U. S. Air Tool Co. ..... Feb.
U. S. Stoneware Co. ..... Feb.
Van Ameringen—Haebler, Div. of International Flavors & Fragrances, Inc. 83
R. T. Vanderbilt Co., Inc. 97

Velsicol Chemical Corp. 27
Vulcan Containers, Inc. ..... Feb.
Vulcan Steel Container Co. 73

Whittaker, Clark & Daniels, Inc. 98
Wyandotte Chemicals Corp., Michigan Alkali Div. 26

Order Reprints Today from PVP

Photo by Eenten

Use Coupon Below

☐ **Epoxy-Based Masonry Materials** by Phillip Maslow—**$2.00**

☐ **Properties of Phthalocyanine Pigments** by Harold T. Lacey, George L. Roberts and Vito A. Giambalvo—**75c**

☐ **Glycerine Alkyds** by N. P. Barr—**75c**

☐ **Outdoor Exposure of Acrylic Emulsion Paints** by Gerould Allyn—**75c**

☐ **Liquid Polybutadiene in Surface Coating** by J. A. Shotton and C. W. Wolfe—**50c**

☐ **Dispersibility of Aluminum Silicates vs. Magnesium Silicates in Zinc Chromate Primers** by Dr. William R. Eubank—**50c**

☐ **Isocyanate Resins for Coatings**—Part I—**$1.25**

☐ **Problems in the Finishing of Automobiles** by Ralph J. Wirshing and Wardley D. McMaster—**50c**

☐ **What to Look for in Used Lift Trucks** by R. F. Moody—**50c**

Name .....
Company .....
Address .....
City ..... State .....

☐ Remittance Enclosed ☐ Bill Me *360*

Words for the wise users of industrial BAKING ENAMELS

...MELAQUA* 600 melamine-acrylic resin

MELAQUA is completely water-soluble and non-inflammable. It produces smoother films with cleaner and brighter colors than conventional-type enamels. It is the first of a new family of water-dispersed thermosetting industrial coating resins for top coats and primers.

Melaqua can be used with complete safety in almost every industrial baking application. Its excellent exterior durability makes it an ideal vehicle for automotive finishes. Write today for full information on **Melaqua** 600.

*TRADEMARK

CYANAMID AMERICAN CYANAMID COMPANY • PLASTICS AND RESINS DIVISION

30 ROCKEFELLER PLAZA, NEW YORK 20, N.Y. • OFFICES IN: BOSTON • CHARLOTTE • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DETROIT • LOS ANGELES MINNEAPOLIS • NEW YORK • OAKLAND • PHILADELPHIA • ST. LOUIS • SEATTLE • IN CANADA: CYANAMID OF CANADA LIMITED, MONTREAL AND TORONTO

enlargement — 19,300X

Unlocking the secrets of kaolin with the electronmicroscope

In order to help paint manufacturers produce better and more uniform products the Georgia Kaolin Company conducts a continuing research and development program which includes advanced techniques in electronmicrography. The illustration which is typical of these studies, clearly shows the unique structure of kaolin particles which are composed of plates and stacks. By varying the ratio of plates to stacks, varying degrees of gloss and hiding can be achieved in a paint formulation.

Every day the knowledge gained through the use of electronmicroscopes, X-ray spectrometers and other modern instruments by the GK Research Laboratories is helping solve problems that have direct bearing on the uniformity, quality and performance of your present products. Of equal, if not greater importance, is the value of this work to your new product development program.

These facilities, the best in the industry, are at your disposal.

Georgia Kaolin Company

433 North Broad Street, Elizabeth, N. J.

Fine clays from the world's largest kaolin plant.

Extended thoughts...

The advent of the electronmicroscope has made it possible to differentiate the basic crystal structure of hydrate aluminum silicate (kaolin) particles. Prior to the development of the electronmicroscope, it was not possible to fully evaluate the crystal structure of kaolin particles. At best optical microscopy could only distinguish the larger particles. The nature of the smaller particles was not fully known. It was inferred from many test results that the small particles had a different structure than the larger particles. However, with the use of the electronmicroscope it has now been proven that kaolin is composed of two basic forms. One is a small plate-like structure, and the other is stacks of individual plates so tightly bound together that it is impossible to separate them by grinding techniques. Generally speaking, the majority of the plates occur at a particle size of less than two microns. At particle sizes larger than two microns the material is composed of the stack structure. It is possible to obtain, by use of the centrifugal techniques, kaolin fractions of all plates, or all stacks, as well as varying ratios of plates and stacks.

In any given paint formulation, the ratio of plates and stacks in the kaolin has a marked effect on the properties obtained. For example, in an interior latex paint formulation the degree of angular sheen is dependent on the percentage of plates in the hydrated aluminum silicate. For a flat paint with no angular sheen a fraction with 100% stacks would be used. For semi-gloss applications a clay with 80% to 100% plates would be recommended. In exterior paints the percentage of plates in the clay appears to effect the chalking rate. Based on our tests the rate of chalking appears to be related to the percentage of stacks under two microns. For less chalking a lower percentage of plates would be used. For a more rapid chalking a higher percentage of plates would be used. More tests are under way to further evaluate these results particularly in the 100% stacks ratio.